

# TM 10-4500-200-13

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

---

OPERATOR, ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE MANUAL,  
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

HEATERS, SPACE: RADIANT TYPE, PORTABLE (TYPE I, MODEL M1941, SOLID  
FUEL) FSN 4520-257-4877 (TYPE II, MODEL M1941, LIQUID FUEL)  
FSN 4520-927-4214 (YUKON MODEL M1950, SOLID OR LIQUID FUEL)  
FSN 4520-287-3353

HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS,  
(ALL MAKES AND MODELS) FSN 4540-266-6835 (PREWAY MODEL  
447-2EX) FSN 4540-453-9140 FOR TANK TRAILER,  
(ALL MAKES AND MODELS)  
FSN 4540-266-6834

**This copy is a reprint which includes current  
pages from Changes 1 and 3 through 13.**

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HEADQUARTERS, DEPARTMENT OF THE ARMY

10 DECEMBER 1969

## **SAFETY PRECAUTIONS**

### **BEFORE OPERATION**

Do not fill fuel tanks indoors - spillage may cause a hazardous condition.

Wipe up all spilled fuel and be sure that the fuel valve end of the tank is free of fuel and dry.

Insure that space heater installation is complete and meets installation requirements.

Do not operate heater in a totally confined area. Sufficient ventilation to eliminate the accumulation of carbon monoxide fumes must be available.

Inspect fuel container and lines for leaks. Repair leaks before lighting heater.

Keep fuel outside the tent. Never store spare can of fuel in the tent.

Fire extinguisher should be readily available for use, and all personnel instructed in the use of such fire extinguisher.

### **DURING OPERATION**

Do not pour gasoline or oil on fire.

Do not operate the stove at full blast even in extremely cold weather. Overheated stovepipe may ignite tentage.

Keep face and hands away from stove lid opening when igniting fuel in oil burner.

CHANGE

NO. 19

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 30 November 1994

Operator, Organizational and Direct Support  
Maintenance Manual  
Including Repair Parts and Special Tools List

HEATERS, SPACE: RADIANT TYPE, PORTABLE  
(TYPE I, MODEL M1941, SOLID FUEL) NSN 4520-00-257-4877  
(TYPE II, MODEL M1941, LIQUID FUEL) NSN 4520-00-927-4214  
(YUKON MODEL M1950, SOLID OR LIQUID FUEL) NSN 4520-00-287-3353  
HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS  
(ALL MAKES AND MODELS) NSN 4520-00-266-6835  
(PREWAY MODEL 447-2EX) NSN 4520-00-453-9146  
FOR TANK TRAILER (ALL MAKES AND MODELS) NSN 4540-00-266-6834

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited

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Remove pages

2-9 and 2-10

2-21 and 2-22

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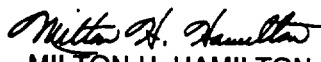
2-9 and 2-10

2-21 and 2-22

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Official:



MILTON H. HAMILTON

Administrative Assistant to the  
Secretary of the Army

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GORDON R. SULLIVAN  
General, United States Army  
Chief of Staff

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25-E, block no.1009, requirements for  
TM 10-4500-200-13.

CHANGE

HEADQUARTERS

DEPARTMENT OF THE ARMY

NO. 18

WASHINGTON, D.C., 1 February 1994

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools List

HEATERS, SPACE: RADIANT-TYPE PORTABLE  
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FOR TANK TRAILER (ALL MAKES AND MODELS) NSN 4540-00-266-6834

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Remove pages

Insert pages

2-21 and 2-22

2-21 and 2-22

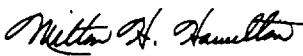
4-17/(4-18 blank)

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NO. 17

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 30 December 1993

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools List

HEATERS, SPACE: RADIANT-TYPE PORTABLE  
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Remove pages

a/(b blank)  
1-1 and 1-2  
2-5 and 2-6

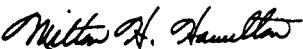
Insert pages

a/(b blank)  
1-1 and 1-2  
2-5 and 2-6

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NO. 16

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 3 JULY 1992

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools List

**HEATERS, SPACE: RADIANT-TYPE PORTABLE**  
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**(PREWAY MODEL 447-2EX) NSN 4520-00-453-9146**  
**FOR TANK TRAILER (ALL MAKES AND MODELS) NSN 4540-00-266-6834**

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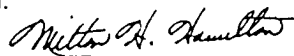
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NO. 15

HEADQUARTERS,  
DEPARTMENTS OF THE ARMY  
WASHINGTON, D.C., 20 NOVEMBER 1990

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE PORTABLE  
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Remove pages

2-11 and 2-12  
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2-21 and 2-22  
3-11 and 3-12

Insert pages

2-11 and 2-12  
2-20.1/(2-20.2 blank)  
2-21 and 2-22  
3-11 and 3-12

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Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE PORTABLE  
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Remove pages

2-1 through 2-8  
2-8.1 and 2-8.2  
2-9 through 2-14  
2-14.1  
2-15 through 2-18  
2-19/2-20  
2-21 and 2-22  
2-23 through 2-25/2-26  
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---  
4-9 and 4-10  
A-1/A-2  
C-1 through C-3  
I-1 and I-2

Insert pages

2-1 through 2-8  
---  
2-9 through 2-14  
---  
2-15 through 2-18  
2-19 and 2-20  
2-21 and 2-22  
---  
3-2.1/3-2.2  
4-8.1/4-8.2  
4-9 and 4-10  
A-1/A-2  
C-1 through C-3/C-4  
I-1 and I-2

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NOTICE: Change 13 is being distributed prior to Change No. 11 because of priority. Change 11 will be forthcoming. TM changes must be inserted in numerical sequence.

# URGENT

TM 10-4500-200-13  
C 13

CHANGE }  
NO. 13 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 24 March 1989

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

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a/b

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## DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Unit and Direct Support Maintenance requirements for Heaters, Space; MDL 1941, Type I & II; Yukon, MDL M1950; Immersion Heaters, Liquid Fuel Fired (From Cans), All Makes & Models

NOTICE: Change 12 is being distributed prior to Change No. 11 because of priority. Change 11 will be forthcoming. TM changes must be inserted in numerical sequence.

# URGENT

TM 10-4500-200-13  
C 12

CHANGE }  
NO. 12 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 18 March 1989

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE, PORTABLE  
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Remove pages

Insert pages

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# URGENT

CHANGE }  
NO. 11 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 17 March 1989

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE, PORTABLE  
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FOR TANK TRAILER, (ALL MAKES AND MODELS) NSN 4540-00-266-6834

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Remove pages

2-13 and 2-14  
2-21 through 2-25/2-26  
4-15 through 4-17/4-18  
4-19/4-20

Insert pages

2-13 and 2-14  
2-21 through 2-25/2-26  
4-15 through 4-17/4-18  
4-19/4-20

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*Chief of Staff*

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*Brigadier General, United States Army*  
*The Adjutant General*

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To be distributed in accordance with DA Form 12-25A, Operator, Unit and Direct Support Maintenance requirements for Heaters, Space; MDL 1941, Type I & II; Yukon, MDL M1950; Immersion Heaters, Liquid Fuel Fired (From Cans), All Makes & Models

CHANGE }  
NO. 10 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 30 September 1987

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE, PORTABLE  
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Remove pages

2-19/2-20  
2-21 through 2-24  
2-25/2-26  
3-9 through 3-12  
3-13/3-14  
4-15 and 4-16

Insert pages

2-19/2-20  
2-21 through 2-24  
2-25/2-26  
3-9 through 3-12  
3-13/3-14  
4-15 and 4-16

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*General, United States Army*  
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**Official:**

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*Brigadier General, United States Army*  
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CHANGE }  
No. 9 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 16 January 1987

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE, PORTABLE  
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(PREWAY MODEL 447-2EX) NSN 4540-00-453-9146  
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Remove pages

1-1 and 1-2  
2-19/2-20  
2-21 through 2-24  
3-7 and 3-8

Insert pages

1-1 and 1-2  
2-19/2-20  
2-21 through 2-24  
3-7 and 3-8

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*General, United States Army*  
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DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Organizational and Direct Support Maintenance requirements for Heaters, Immersion, Liquid Fuel; Radiant, Type I & II, Portable.

CHANGE

No. 8

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 1 May 1986

Operator, Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools Lists

HEATERS, SPACE: RADIANT-TYPE, PORTABLE  
(TYPE 1, MODEL M1941, SOLID FUEL) NSN 4520-00-257-4877  
(TYPE 11, MODEL M1941, LIQUID FUEL) NSN 4520-00-927-4214  
(YUKON MODEL M1950, SOLID OR LIQUID FUEL) NSN 4520-00-287-3353  
HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS  
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FOR TANK TRAILER, (ALL MAKES AND MODELS) NSN 4540-00-266-6834

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Remove pages

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2-13 and 2-14  
2-17 and 2-18  
2-23 and 2-24  
A-1/A-2

Insert pages

a/b

2-5 and 2-6  
2-13 and 2-14  
2-17 and 2-18  
2-23 and 2-24  
A-1/A-2

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CHANGE }  
No. 7 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON D.C., 18 August 1982

**Operator's Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools List  
HEATERS, SPACE: RADIANT-TYPE; PORTABLE (TYPE 1, MODEL M1941, SOLID FUEL)  
NSN 4520-00-257-4877 (TYPE 11, MODEL M1941, LIQUID FUEL) NSN 4520-00-927-4214  
(YUKON MODEL M1950, SOLID OR LIQUID FUEL) NSN 4520-00-287-3353  
HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS  
(ALL MAKES AND MODELS) NSN 4540-00-266-6835  
(PREWAY MODEL 447-2EX) NSN 4540-00-453-9146  
FOR TANK TRAILER, (ALL MAKES AND MODELS) NSN 4540-00-266-6834**

TM 10-4500-200-13, 10 December 1969, is changed as follows.

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 2	2-19 (2-20 blank)	2-19 (2-20 blank)
	2-21 and 2-22	2-21 and 2-22
Chapter 3	3-3 and 3-4	3-3 and 3-4

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

**E. C. MEYER**  
*General, United States Army*  
*Chief of Staff*

Official:

**ROBERT M. JOYCE**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-25A, Operator Maintenance Requirements for Heater, Water and DA Form 12-25C, Operator Maintenance requirements for Heaters and Stoves, Miscellaneous.



Change )  
 )  
No. 6 )

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D. C., 30 September 1976

**Operator's Organizational and Direct Support Maintenance Manual  
Including Repair Parts and Special Tools List  
HEATERS, SPACE: RADIANT-TYPE; PORTABLE (TYPE I, MODEL M1941, SOLID FUEL)  
NSN 4520-00-257-4877 (TYPE II, MODEL M1941, LIQUID FUEL) NSN 4520-00-927-4214  
(YUKON MODEL M1950, SOLID OR LIQUID FUEL) NSN 4520-00-287-3353  
HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS  
(ALL MAKES AND MODELS) NSN 4540-00-266-6835  
(PREWAY MODEL 447-2EX) NSN 4540-00-453-9146  
FOR TANK TRAILER, (ALL MAKES AND MODELS)) NSN 4540-00-266-6834**

TM 10-4500-200-13, 10 December 1969, is changed as follows.

1. Remove old pages and insert new pages as indicated below. New or changed material by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

*Remove pages*

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2-19 (2-20 blank)

2-19 (2-20 blank)

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**WARNING**

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**DEATH OR SERIOUS INJURY**

When gasoline is unavailable, the authorized alternate or emergency fuels are: Kerosene, Diesel, JP-4, JP-5, and JP-8 or mixtures thereof. **CAUTION:** Do not mix gasoline with any of these fuels. These fuels maybe used with limited success as long as the same safety precautions taken with gasoline are followed. However, the heavier fuels, primarily Diesel, may be limited in low temperature operability by the pourpoint. Only fuels with a pourpoint below the lowest anticipated operating temperature should be used. The ability of each fuel to ignite (Flash Point) will vary with each fuel and will also depend on the fuel temperature. The key point is, in order for fuel to burn, it first must be heated to a certain temperature.

Operation with the alternate or emergency fuels will usually result in increased lighting difficulties, decreased efficiency, more frequent adjustments to the fuel flow rate, increased smoke output and shorter intervals between scheduled cleaning.

---

**WARNING**

---

**DEATH OR SERIOUS INJURY**

Ignition with JP-4 is identical to gasoline and the same lighting procedure applies. Normal ignition procedures can not be used with JP-5, JP-8 and the Diesel fuels. The igniter cup wick can be lighted with a match, however, with these fuels oversaturation of the wick will create lighting difficulties. If the wick cup is overfilled, the heater will have to be dismantled to drain the cup. Ignition with these heavier fuels is accomplished by preheating the burner flue in the normal way, then ignite apiece of paper, dropping it onto the burner plate and start the fuel flow.

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**WARNING**

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**DEATH OF SERIOUS INJURY**

Operation of the heater with Diesel fuel is very unsatisfactory. Combustion of Diesel fuel is very unstable and unburned fuel may accumulate in the bottom of the heater. This accumulation may later reignite after the fuel is shut off, by the still hot baffle plate, creating a potential safety problem. If accumulation occurs, shut down heater and allow it to completely cool down (approximately 1/2 hour). Do NOT move heater until completely cool, and do NOT add water to aid cool-down. Then drain excess fuel from burner compartment of heater prior to relocation and storage of heater.

Under all conditions and with all fuels the possibility of a Flashback can occur. This is the result of the burner being ignited, before the draft has been established in the burner flue, with the fuel vapor present in the base of the heater. It is important that the operator be aware, the draft must be established by preheating the burner flue before lighting and the operator should not expose their face to the burner compartment while lighting or adjusting the fuel flow.

Technical Manual }  
No. 10-4500-200-13 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D. C., 10 December 1969

**OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL  
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS**

**HEATERS, SPACE: RADIANT TYPE, PORTABLE (TYPE I, MODEL M1941, SOLID FUEL)  
FSN 4520-257-4877 (TYPE II, MODEL M1941, LIQUID FUEL) FSN 4520-927-4214  
(YUKON MODEL M1950, SOLID OR LIQUID FUEL) FSN 4520-287-3353**

**HEATERS, IMMERSION: LIQUID FUEL FIRED, FOR CORRUGATED CANS,  
(ALL MAKES AND MODELS) FSN 4540-266-6835  
(PREWAY MODEL 447-2EX) FSN 4540-453-9146  
FOR TANK TRAILER, (ALL MAKES AND MODELS) FSN 4540-266-6834**

*Current as of 12 March 1973*

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\*This manual supersedes TM 10-735,14 February 1952, TM 10-725,19 March 1952; TM 10-4540-201-15,16 January 1961, TM 10-4520-202-25P, 19 April 1963; TM 10-4520-203-25P, 15 February 1963; and TM 10-4540-201-24P, 5 October 1962, including all changes.

	Paragraph	Page
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# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1-1. Scope

a. This manual contains instructions for the use of personnel to whom the heaters are issued. Individual models are described in separate chapters. Each chapter contains instructions for the use of operator and organizational personnel operating and maintaining the heaters as allocated by the maintenance allocation chart. A repair parts list applicable to the individual model heater is provided in the chapter pertinent to that heater.

b. Report all equipment improvement recommendations as prescribed by DA Pam 738-750.

c. The reporting of errors, omissions, and recommendations for improving this publication by the individual

user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798.

#### 1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to DA Pam 738-750.

### Section II REPAIR PARTS

#### 1-3. Scope

This section consists of an explanatory introduction for the tabular lists and illustrations of repair parts required to operate and maintain the individual dual model heater. The explanatory introduction is applicable to each tabular listing in the respective chapters.

#### 1-4. General

a. The repair parts list is arranged as follows:

(1) Individual parts and major assemblies are listed alphabetically by item name.

(2) Assembly components and subassemblies are listed alphabetically by item name under major assemblies.

b. This repair parts and special tools list is divided into the following tabular listings.

(1) The first tabular listing following the narrative portion of a chapter contains a list of repair parts authorized for the performance level of maintenance at the organizational level.

(2) Repair parts authorized for the performance of maintenance at the direct support level are in a listing following the Repair Parts for organizational level.

#### 1-5. Explanation of Columns

The following provides an explanation of columns in the tabular lists.

a. *Source, Maintenance, and Recoverability Codes (SMR).*

(1) *Source Code.* This column indicates the selection status and source for the listed item. S-codes used are:

<i>Code</i>	<i>Explanation</i>
P	Applied to repair parts which are stocked in or supplied from DSA/GSA or the Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at the indicated maintenance levels.
A	Applied to assemblies which are not procured or stocked as such, but are made up of two or more units, each of which carries an individual stock number and description and is procured and stocked separately and can be assembled by units at the indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item or component, and the failure of which should result in retirement of the end item from the supply system.
X 1	Applied to repair parts which are not procured or stocked, the requirement for which will be filled by use of the next higher assembly or component.
X 2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missiles Army) funds for initial issue only, to be used as exchange assemblies at the DSU maintenance level. These assemblies will not be stocked above the DSU level or returned to the depot supply level.
	(2) <i>Maintenance Code.</i> This code indicates the lowest level of maintenance authorized to install the listed item. The maintenance level codes are:

Code	Explanation
O	Organizational maintenance Direct support maintenance

(3) *Recoverability Code.* This code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components) which are considered economically repairable at the direct support and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

(4) This column also lists, below the SMR code, an index number for each item in ascending numerical sequence, which is used to locate items in the publication when the Federal stock number and/or reference number is known.

*b. Federal Stock Number.* This column indicates the Federal stock number for the item.

*c. Description.* This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is preceded by the applicable fivedigit Federal supply code for manufacturers in parentheses.

*d. Unit of Measure.* This column indicates the unit used as a basis for issue; e.g., ea, pr, ft, yd; etc.

*e. Quantity Incorporated in Unit.* Indicates the quantity of the item used in the functional group.

*f. Fifteen-Day Organizational Maintenance Allowances.*

(1) The allowance columns are divided into four subcolumns. Indicated in each subcolumn opposite the first appearance of each item is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have no allowance columns but will

have in the description column a reference to the first appearance of the item. Items authorized for use as required, but not for initial stockage are identified with an asterisk in the allowance column.

(2) The quantitative allowances for organizational level of maintenance represents one initial prescribed load for a 15-day period for the number of equipments supported. Units and Organizations authorized additional prescribed loads will multiply the number of prescribed loads authorized by the quantity of repair parts reflected in the appropriate density column to obtain the total quantity of repair parts authorized.

(3) Organizational units providing maintenance for more than 100 of these equipments will determine the total quantity of parts required. This is done by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance columns. Example The authorized allowance for 51-100 equipments is 12; therefore, for 140 equipments multiply 12 by 1.40 to obtain 16.80; rounded off this gives 17 parts required.

(4) Subsequent changes to allowances will be limited as follows No change in the range of items is authorized. If additional items are considered necessary, a recommendation should be forwarded to US Army Troop Support Command for exceptions or revisions to the allowance list. Revisions to the range of items authorized will be made by this Command based upon engineering experience, demand data, or TAMMS information.

*g. Thirty-Day DS Maintenance Allowances.*

(1) The allowance columns are divided into three subcolumns. Indicated in each subcolumn, opposite the first appearance of each item, is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have no entry in the allowance column, but will have in the description column a reference to the first appearance of the item. Items authorized for use as required but not for initial stockage are identified with an asterisk in the allowance column.

(2) The quantitative allowances for direct support levels of maintenance will represent initial stockage for a 30-day period for the number of equipments supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a

decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance column. Example, authorized allowance for 51-100 equipments is 40; for 150 equipments multiply 40 by 1.50 or 60 parts required.

*i. One Year Allowances Per 100 Equipments/Contingency Plan Planning Purposes.* Indicates opposite the first appearance of each item the total quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for one year.

*j. Illustration.*

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

## 1-6. Special Information

*a.* Repair parts mortality has been based on 2000 hours of operation per year.

*b.* Parts which require manufacture or assembly at a level higher than that authorized for installation will indicate in the source column the higher level.

## 1-7. How to Locate Repair Parts

*a.* When Federal stock number or reference number is unknown:

(1) *First.* Determine the assembly group within which the repair part belongs.

(2) *Second.* Find the illustration covering the assembly group to which the repair part belongs.

(3) *Third.* Identify the repair part on the illustration, and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the assembly group to which the repair part belongs and locate the illustration figure and item number noted on the illustration

*b.* When Federal stock number or reference number is known:

(1) *First.* Using the Index of Federal Stock Numbers and Reference Numbers, find the pertinent Federal stock number or Reference Number. This index is in ascending alpha-numeric sequence cross-referenced to an index number.

(2) *Second.* Using the Repair Part Listing, find the index number referenced in the Index of Federal Stock Numbers and Reference Numbers.

## 1-8. Federal Supply Codes for Manufacturers

<i>Code</i>	<i>Manufacturer</i>
08288. . . . .	Military Supply Standards
24617. . . . .	General Motors Corp., 3044 Grand Blvd., W. Detroit, Mich. 48202
31577. . . . .	Jaeger Machine Co. The, 550 W. Spring St., Columbus, Ohio 43216
48745. . . . .	Preway Inc
72795. . . . .	Eagle Lock Corp., 20 South Main Street Terry vine, Corm. 06786
81337. . . . .	Army NATICK Laboratories, Mechanical Engineering Div., Natick, Mass.
81349. . . . .	Military Specifications Promulgated by Standardization Div. Directorate of Logistic Services DSA
91494. . . . .	Controls Co of America Heating and Air Conditioning Division
93084. . . . .	Vogt Brothers Mfg. Co., P.O. Box 922, Louisville, Ky. 40201



## CHAPTER 2

### HEATER, SPACE, RADIANT TYPE PORTABLE, SOLID FUEL (MODEL M1941, TYPE I) FSN 4520-277-4877 AND LIQUID FUEL (MODEL M1941, TYPE II) FSN 4520-927-4214

#### Section I. DESCRIPTION AND TABULATED DATA

##### 2-1. Description

*a. General.* The M1941, Type I and II space heaters (fig. 2-1) are designed to heat personnel tents. The heater assembly consists of essentially a heater body top and bottom, adapter ring, grate or liquid fuel burner assembly, and air conditioning-heating pipe sections.

*b. Accessories.* Accessories such as a spark arrestor (for Model M1941, Type I), tent shield, and elbow are not stocked with a complete space heater. Refer to paragraph 2-42 for accessory part number.

*c. Fuel.*

(1) Type I. Unless the Conversion Kit has been installed, the Type I heater burns wood or coal. With the Conversion Kit installed, the Type I heater burns liquid fuel (diesel oil, light fuel oil or gasoline). Follow operating and maintenance instructions for Type II heaters if your Type I heater has been converted to burn liquid fuel.

(2) Type II. All Type II heaters operate with liquid fuel.

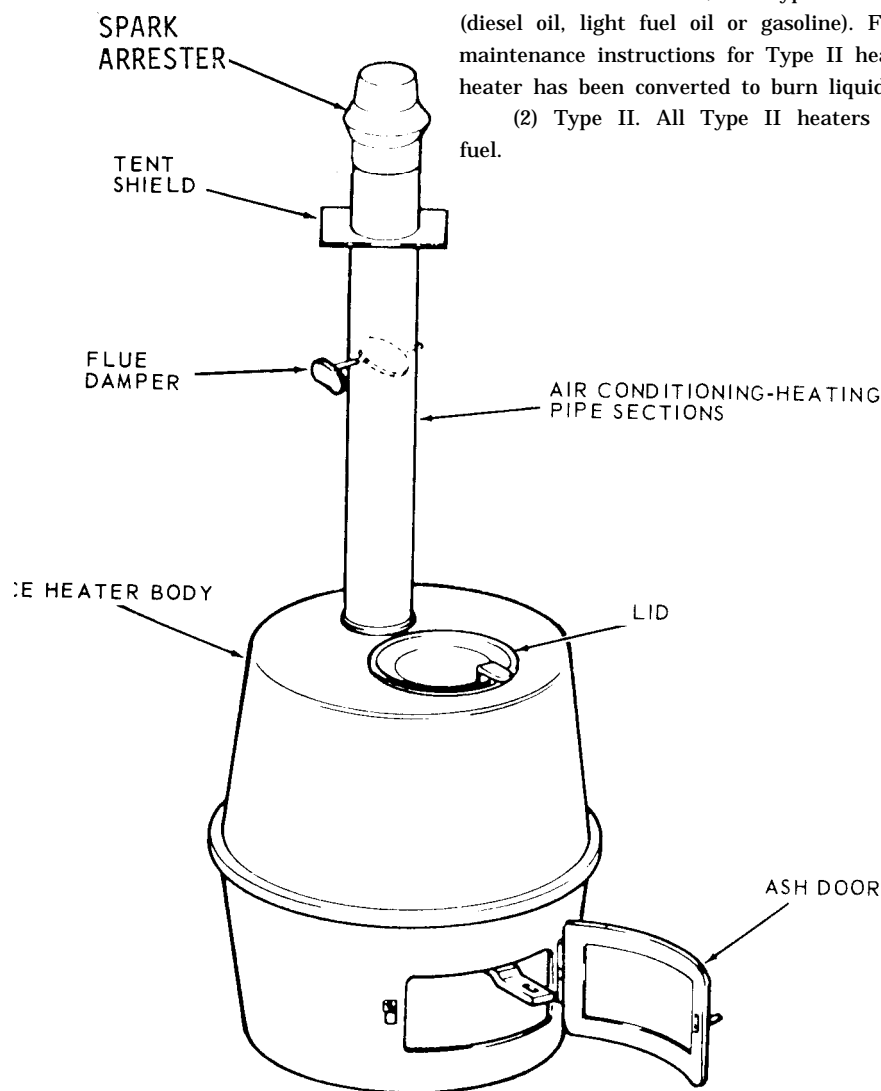


Figure 2-1. Space heater (Type I without Conversion Kit installed) (sheet 1 of 2).

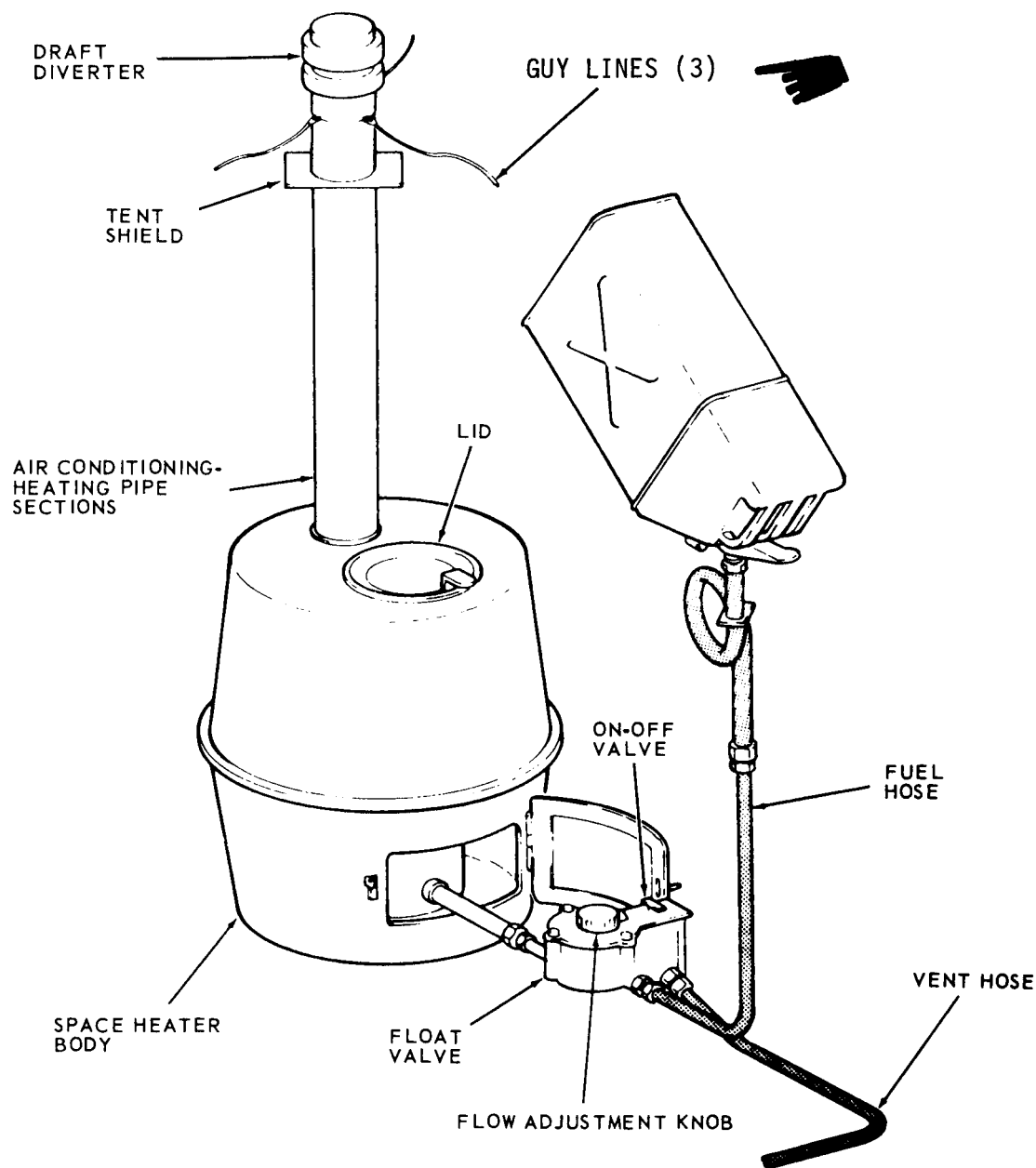


Figure 2-1. Space heater (Type II and Type I with Conversion Kit installed) (sheet 2 of 2).

## 2-2. Tabulated Data

ata for the space heaters are tabulated as follows:

Model.....	M1941, Types I and II
FSN(Type I) .....	4520-257-4877
FSN(Type II) .....	4520-927-4214

## Fuel Consumption:

Type I without Conversion Kit

installed (coal). . . . . 1/4 ton (per week)

Heat output (normal) . . . . . 35,000 BTU (British Thermal Units) per hour

Heatoutput (maximum) . . . . . 45,000 BTUperhour

Type II and Type I with Conversion

Kit installed (gasoline or oil). . . . 5 gallons for 10 to 30 hours

## Section II. INSTALLATION AND OPERATING INSTRUCTIONS

### 2-3. Service Upon Receipt of Materiel

Space heaters are packaged in separate containers to protect them during shipment and storage. Container and heater weigh approximately 78 pounds.

### 2-4. Unpacking the Equipment

*a. General.* The space heater is shipped in a wood crate. All components to this heater are stowed within the heater crate.

*b. Uncrating.* Remove the heater from the shipping container, being careful not to damage the heater when opening the container.

*c. Depreservation.* Prior to placing the heater in operation, accomplish depreservation in accordance with instructions outlined in DA Form 2258 (Depreservation Guide for Vehicles and Equipment). DA Form 2258 is attached to the heater assembly.

### 2-5. Inspection and Servicing of Equipment

#### *a. Inspection.*

(1) Inspect the entire heater assembly for signs of physical damage.

(2) Inspect the heater to be sure that is properly assembled, secure, clean, correctly adjusted, and mechanically operable.

(3) Correct deficiencies within the scope of organizational maintenance before placing the heater in service.

#### *b. Servicing.*

(1) Perform the daily preventive maintenance services (para 2-21).

(2) No lubrication required.

### 2-6. Installation of Separately Packaged Components

No separately packaged items are shipped with the heater.

### 2-7. Installation or Setting Up Instructions

*a. Location.* Place heater base on ground or floor of tent. In tents with wooden floors, the base should be set in a sandbox or on nonflammable, insulating sheeting to protect the floor from heat. In an emergency, a pile of stones or brickbats may be used. The sandboxes will meet the following standards:

(1) The sandboxes will be constructed so that they are no smaller than 40 inches long by 28 inches wide and 4 inches high. Use 2- by 4-inch lumber for the framework.

(2) The sandboxes will have sheet metal bottoms to act as insulating shields.

(3) Stoves will be placed in the center of the boxes with a minimum of 3 1/2 inches of sand between the bottom of the stove and the metal insulation shield.

(4) Areas surrounding the stoves will be void of combustibles at any point closer than four feet on a horizontal plane from the floor to the ceiling of the tent or building. Necessary material will be secured locally upon approval of the local commander.

#### *b. Setting Up (Type I).*

### NOTE

If the Conversion Kit is to be installed on your Type I heater, setup in accordance with the kit instruction sheet.

Refer to figure 2-2 and assemble the space heater components.

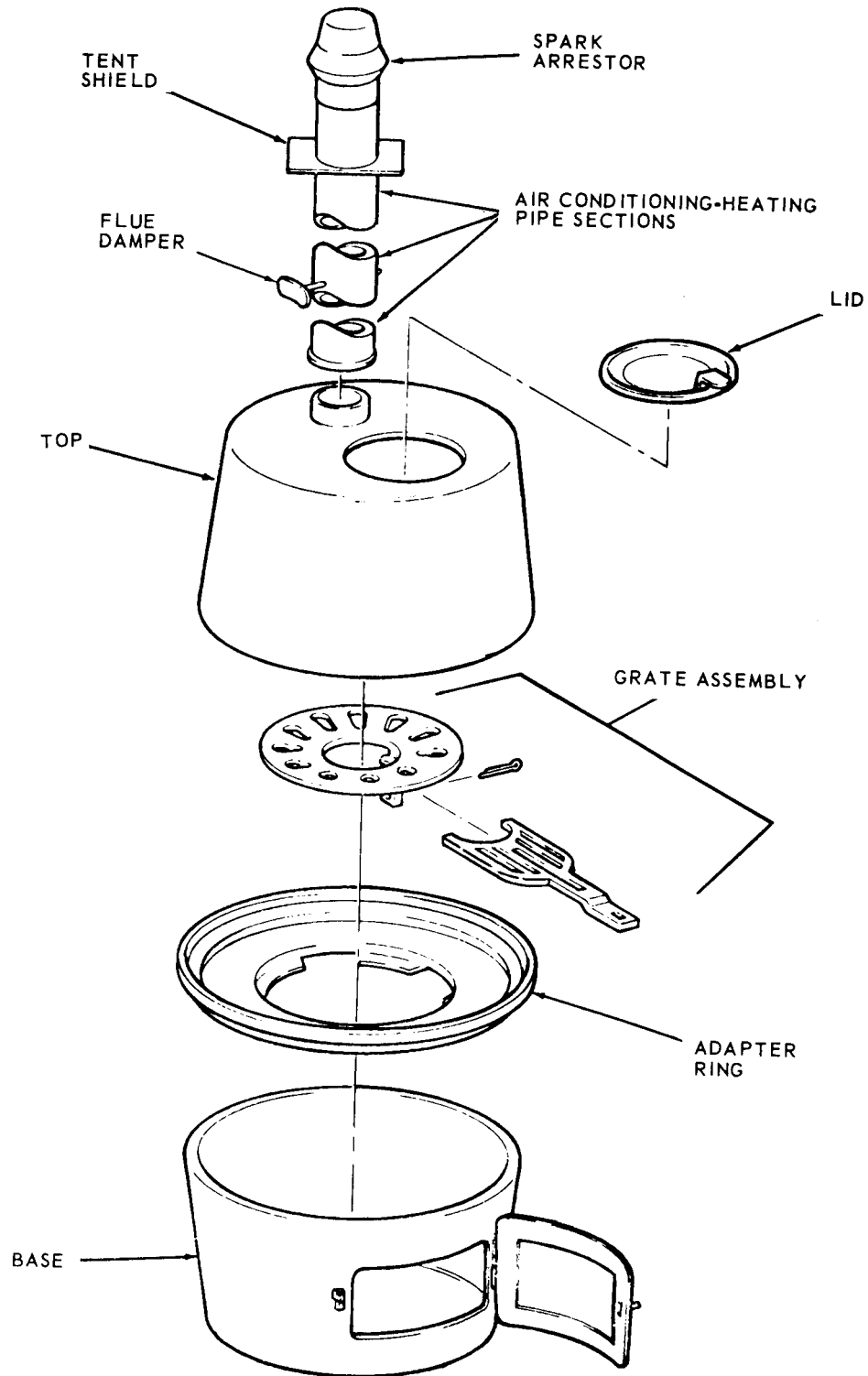


Figure 2-2. Space heater installation (Type I without Conversion Kit installed) (Sheet 1 of 4).

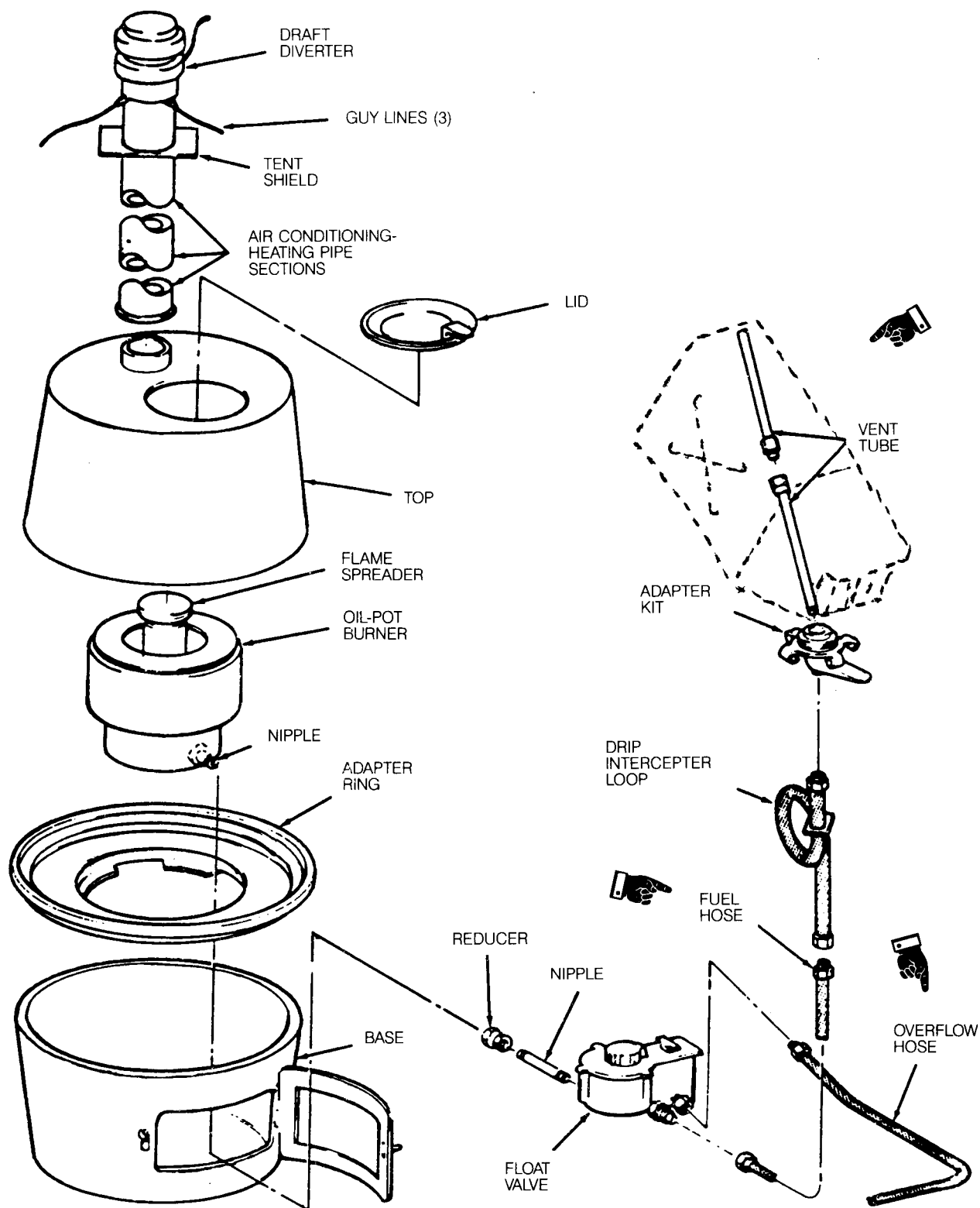
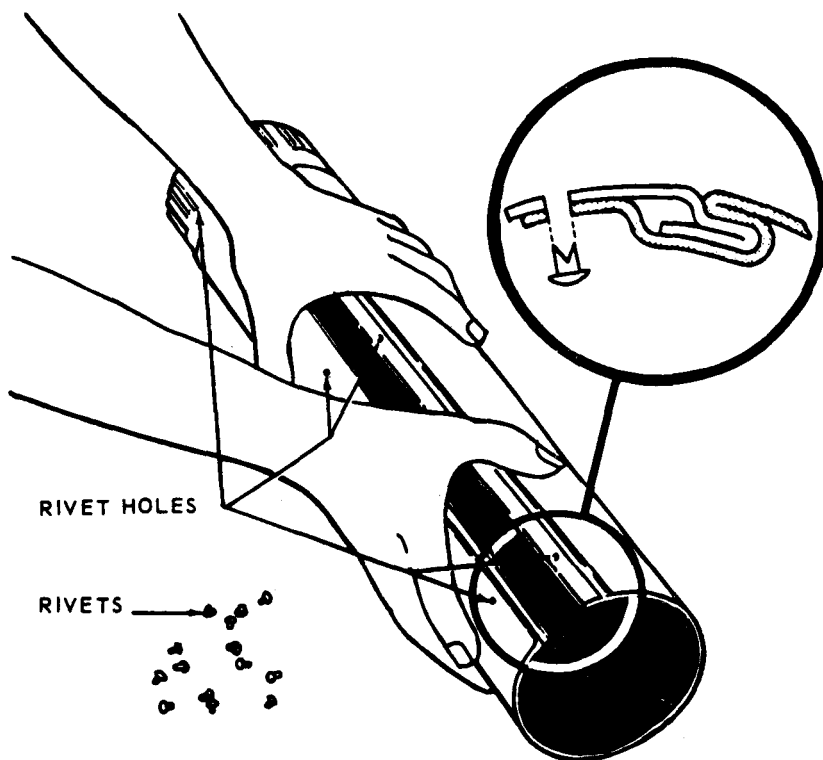
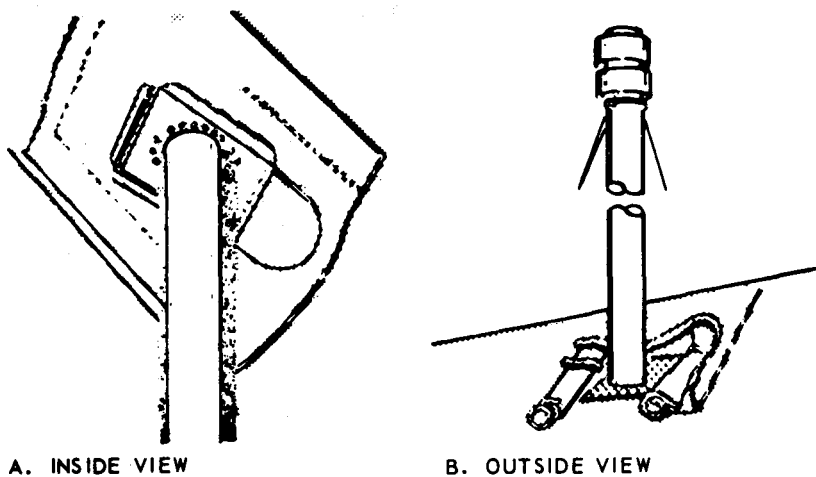


Figure 2-2. Space heater installation (Type II and Type I with Conversion Kit installed) (Sheet 2 of 4).



ME 4500-200-13/2-2 ③

Figure 2-2. Space heater installation (Types I and II) (sheet 3 of 4).



ME 4500-200-13/2-2 ④ C3

Figure 2-2. Space heater installation (Types I and II) (sheet 4 of 4).

- (1) Assemble the grate.
- (2) Place the adapter ring on top of the base. Level the heater base by sight.
- (3) Insert the grate assembly in the adapter ring, with the shaker catch facing the ash door and the draw rate on the bottom.
- (4) Place the top of the space heater on the adapter ring.
- (5) Refer to figure 2-2 and assemble the air conditioning smoke pipe as follows:
  - (a) Join the formed edges of a curved sheet of metal to form a cylindrical pipe.

**WARNING**

Hold the sheet metal securely while curling it to prevent it from slipping and causing severe cuts.

- (b) From the inside, insert a split rivet through each of the three holes in the smoke pipe section. Spread the tines of the rivet and hammer them flat.

**NOTE**

The damper is not required in the smoke pipe when burning liquid fuel.

- (c) In one section of smoke pipe insert the damper. Punch a hole through the pipe at a position half the length of the pipe. Hold the damper in place inside the pipe and thread the damper shaft through the holes, locking the curved shank of the damper shaft into the center slot of the damper. When properly locked together, the damper and operating handle will be parallel.

- (6) Assemble the smoke pipe sections starting with the section of pipe having the damper installed. Place the smooth female end of the pipe over the steel collar on the heater top.

**NOTE**

When conditions permit, use six lengths of pipe extended straight up. Elbows and horizontal pipes reduce the draft and cut down heat output.

- (7) Install the spark arrestor one (1) pipe section above the heater or on top of the smoke pipe outside of the shelter.

*c. Setting Up (Type II).* Refer to figure 2-2 and assemble the space heater.

- (1) Place the adapter ring on the heater base.
- (2) Set the oil pot burner in the adapter ring so that the fuel inlet pipe faces the ash door opening.

- (3) Turn the adapter ring to the right until it engages the locking clips on the burner. The fuel inlet pipe should beat the right side of the door opening.

- (4) Install the flame spreader in the center of the burner.

- (5) Attach the float valve nipple to the smaller end of the pipe reducer located on the burner pot. Make sure the connection is tight enough to hold the valve in a level position and to prevent leaks.

**NOTE**

Use V jaw wrench to tighten the pipe connections.

- (6) Place the top of the space heater on the adapter ring.

- (7) Assemble the pipe (para 2-7b(5)).

- (8) Install the draft diverter on top of the stack and anchor it with guy lines.

**CAUTION**

Install the guy lines radially to eliminate contact with the smoke pipe. Lines should be erected and anchored so that the movement of the tent does not adversely effect the stability of the smoke pipe.

- (9) Assemble the fuel can adapter, and insert it in the fuel can as follows:

- (a) Refer to figure 2-3; assemble the fuel can adapter, and insert it in the fuel can.

**CAUTION**

When changing fuel cans, release the cam before removing the adapter from the empty can. The washer on the adapter may squeeze out of place when the adapter is screwed into place on the fuel can. Wipe excess fuel from the washer, washer seat, and the lid of the fuel can.

- (b) Attach the male end of one fuel hose to the drip loop hose of the adapter, and attach the opposite female end of the hose to the male fuel inlet fitting of the float valve.

- (c) Attach the other length of hose to the overflow fitting (under the center of the float valve) to carry off any possible overflow. This hose must drain downward and discharge into a safe outside location.

**CAUTION**

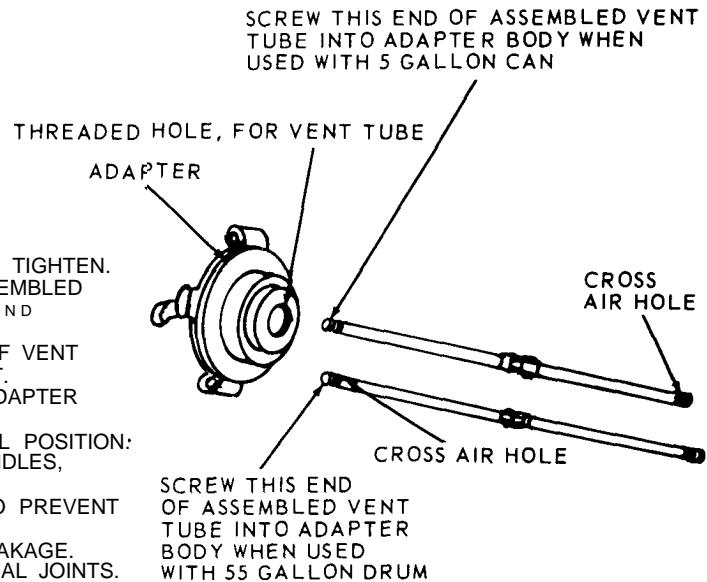
Be sure that the fuel hose from the fuel can is connected to the male fitting marked INLET on the valve.

### INSTRUCTIONS

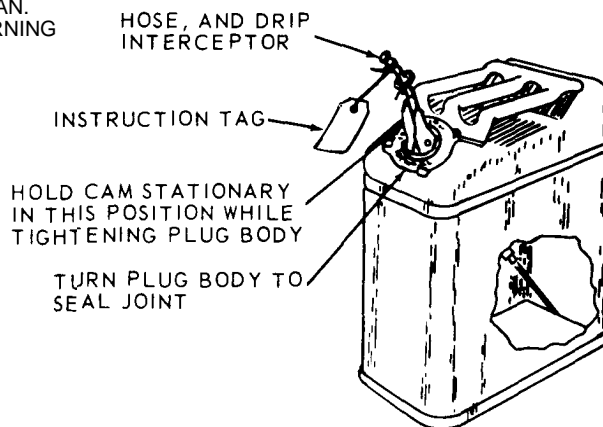
1. ASSEMBLE THE TWO PIECES OF VENT TUBE AND TIGHTEN.
2. FOR 5 GAL. CAN. SCREW THE PLAIN END OF ASSEMBLED VENT TUBE INTO ADAPTER, WITH AIR HOLE AT END FURTHEST FROM ADAPTER BODY.
3. FOR 55 GA L. DRUM, SCREW THE AIR HOLE END OF VENT TUBE INTO ADAPTER BODY WITH PLAIN END OUT.
4. ASSEMBLE HOSE, GASOLINE, SCREW TYPE, TO ADAPTER KIT, GRAVITY FEED, AND TIGHTEN.
5. RELEASE CAM AND HOLD CAM FREE IN VERTICAL POSITION:
6. WITH CAM IN FREE POSITION, TOWARDS CAN HANDLES, INSERT ADAPTER IN CAN.
7. HOLD CAM IN FREE POSITION WITH ONE HAND TO PREVENT ROTATION. TURN PLUG BODY DOWN TIGHT TO PREVENT LEAKAGE.
8. PRESS CAM DOWN TOWARDS CAN HANDLES TO SEAL JOINTS.

### CAUTION

RELEASE CAM BEFORE REMOVING ADAPTER FROM CAN. DO NOT PERMIT ADAPTER BODY TO TURN WHILE TURNING PLUG BODY.



A. VENT TUBE INSTALLATION



B. FUEL CAN WITH ADAPTER INSTALLED

Figure 2-3. Fuel can adapter installation  
(Type II and Type I with Conversion Kit installed).

(d) Make sure that the inlet shutoff knob on the float valve is in the OFF position.

(e) Invert the fuel can on a support no less than 1 foot nor more than 8 feet above the float valve.

#### d. Tent Space Heater Accessories.

(1) Refer to figure 2-4 and select the appropriate accessories for the Type I and Type II heaters.

(2) Installation of smoke pipe shields.

(a) A smoke pipe installation passing through the top of a tent will require a shield having an elliptical hole.

The elliptical-hole shield is installed with both edges within the tent.

(b) A pipe installation passing through the side of a tent will require a shield having a round hole. The round-hole shield is installed with one edge of the shield within the tent, the opposite edge outside the tent.

(c) Tuck the tent canvas into the raised edges on the shields to hold the shields securely in place.



### Section III. MOVEMENT TO A NEW WORK SITE

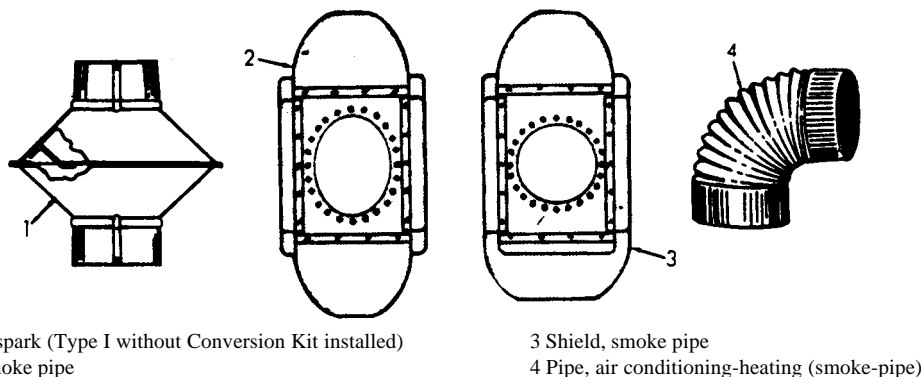
#### 2-8. Dismantling for Movement

##### a. Dismantling.

(1) Type I without Conversion Kit installed. Make sure that the heater is clean and free of ashes, soot, and burnt fuel.

(2) Type II and Type I with Conversion Kit installed. Make sure that the fuel has been drained from the fuel lines, burner and control valve.

(3) Remove the air conditioning-heating pipe (smoke pipe) shield.



1 Arrestor, spark (Type I without Conversion Kit installed)  
2 Shield, smoke pipe

3 Shield, smoke pipe  
4 Pipe, air conditioning-heating (smoke-pipe)

Figure 2-4. M1941 tent space heater accessories.

(4) Type II and Type I with Conversion Kit installed. Remove the fuel lines.

(5) If the unit is being moved to another space in the same area, it can be hand-carried.

b. *Reinstallation After Movement.* Reinstall the space heater at the new work site as directed in paragraph 2-7.

### Section IV. CONTROLS AND INSTRUMENTS

#### 2-9. General

Paragraphs 2-10 and 2-11 describe the various controls and provide the operator/crew with sufficient information to insure proper operation of the space heater.

#### 2-10. Controls (Type I without Conversion Kit installed) (Fig. 2-1.)

Heat output can be regulated by varying the ashpit door opening and by turning the damper in the air conditioning-heating pipe (smoke pipe).

#### 2-11. Controls (Type II and Type 1 with Conversion Kit installed)

a. *Float Valve (Fig. 2-1).* The float valve regulates the amount of fuel that flows to the burner. Two knobs located on the valve cover plate regulate the fuel as it enters and leaves the valve. The valve is equipped with an overflow outlet for drawing off excess fuel in emergencies.

b. *ON-OFF Knob.* The ON-OFF knob governs the fuel supply entering the float chamber of the valve. It has two positions, ON and OFF, indicated on the cover plate.

c. *Flow Adjustment Knob.* The flow adjustment knob governs the amount of fuel flowing from the float chamber of the valve to the burner. The amount of fuel desired is indicated by means of a pointer set on the adjustment knob scale, ranging from 0 to 9. The metering stem is always open sufficiently to permit the flow of enough fuel to maintain a pilot flame to the burner. The pointer is set at 9 to start the fuel flow to the burner and then turned back to 0 before lighting.

## Section V. OPERATION UNDER USUAL CONDITION

### 2-12. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the space heaters.

b. The operator must know how to perform every operation of which the space heater is capable. This section gives instructions on starting and stopping the space heater, operation of the space heater, and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary the procedures to fit the individual job.

### 2-13. Starting (Type I without Conversion Kit Installed)

a. *Preparation for Starting.* Perform the before operation services (para 2-5).

#### b. *Starting.*

(1) Set the damper in its open position.  
 (2) Open the ash door, and remove the heater lid.  
 (3) Put a kindling crisscross on the paper on the grate.

(4) Replace the heater lid.  
 (5) Ignite paper.  
 (6) When the kindling catches fire, put one shovel of coal on the kindling.

(7) When the coal is burning well, close the ash door halfway. Regulate the heat output by varying the ash door opening, and by turning the damper in the smoke pipe.

(8) Add coal at intervals to maintain a firebed of about 3 inches on the grate. Push live coals to rear, and add fresh coal at the front. The escaping gases from the fresh coal will be burned off as they pass over the live coals. Add a shovel of coal after each previous shovel of coal begins to burn, until the desired firebed is reached. Never cover up all of the brightly burning coal with fresh coal.

(9) To remove ashes and clinkers, push the draw grate gently back and forth with the shaker until a faint red glow appears. Use the shaker sparingly. Do not extinguish the fire, or waste fuel by shaking burning coals into the ashpit. Some ashes left on the grate will protect the grate and help control the fire.

(10) To bank the fire, fill the stove with coal and open the ash door slightly. Close the damper in the pipe partially.

### 2-14. Stopping (Type I without Conversion Kit Installed)

a. Shake burning coals into the ashpit.

b. Remove the burning coals, open the ash door, and allow the remaining fire to burn out.

### 2-15. Starting (Type II and Type I with Conversion Kit Installed)

a. *Preparation for Starting.* Perform the before-operation services (para 2-5).

#### b. *Starting with Old Style Float Valve.*

(1) Remove the heater lid.

(2) Turn the ON-OFF valve knob to the ON position and turn the flow adjustment knob up to 9. When the burner bottom is wet with fuel, turn the flow adjustment knob back to 0.

(3) If gasoline is used as fuel, drop a lighted match or paper into the burner before turning the flow adjustment knob to 9. If oil is used, drop a small wad of lighted paper or oily rag into the burner after the bottom is wet with fuel.

#### WARNING

Keep face and hands away from the opening.

(4) When the bottom is blazing, place the top lid. After 5 minutes when using gasoline and after 15 minutes when using oil (time for the heater to warm up), set the adjustment knob for the size of the flare desired. Maintain a clean, smokeless flame. The range of adjustment for gasoline is indicated by an arrow on the dial from 0 to 7. Any setting above 7 will waste fuel and cause heavy smoke. The oil operating range 0 to 9.

#### c. *Starting with New Style Float Valve.*

(1) Remove heater lid.

(2) Set fuel selector control to the proper position for the fuel being used.

(3) Turn ON-OFF valve knob to the ON position and turn the heat output knob up to HI. When the burner bottom is wet with fuel, turn the heat output knob down to Low.

(4) If gasoline is used as a fuel, drop a lighted match or paper into the burner before turning the heat output knob to HI. If oil is used, drop a small wad of lighted paper or oily rag into the burner after bottom is wet with fuel.

#### WARNING

Keep face and hands away from the opening.

(5) When bottom is blazing, replace the top lid. After 5 minutes when using gasoline and after 15 minutes when using oil (time for the heater to warm up), set the heat output knob for the size of flame desired. Maintain a clean, smokeless flame.

### 2-16. Stopping (Type II and Type I with Conversion Kit Installed)

Turn the flow adjustment knob to 0, and then turn the ON-OFF valve to OFF.

#### CAUTION

Do not attempt to light the burner while the burner and heater are warm. If the flame is accidentally extinguished, turn the ON-OFF valve knob to the OFF position immediately. Allow the burner to cool, then wipe up excess fuel from the burner bottom before relighting.

## Section VI. OPERATION UNDER UNUSUAL CONDITIONS

### 2-17. Extreme Cold

*a.* Do not operate the heater at full capacity, even in extreme cold. Overheating of the air conditioning-heating pipe (smoke pipe) may ignite tentage.

*b.* Provide sufficient ventilation for fresh air to enter the tent at all times.

*c.* Do not place the heater directly on snow. The heat will quickly melt the snow, causing the fire to be extinguished.

### 2-18. Strong Winds

*a.* Install the spark arrestor when using the Type I heater without Conversion Kit, and the flue cap when using the Type II heater (or Type I with Conversion Kit) to reduce

smoke pipe draft fluctuations caused by strong winds, and to prevent sparks from being drawn out of the smoke pipe by high winds.

*b.* Install guy lines radially to eliminate contact with the smoke pipe. Guy lines should be erected and anchored in such a way as to prevent movement of the tent from adversely affecting the stability of the smoke pipe.

*c.* Make sure that all smoke pipe connections are tight.

### 2-18.1. Sandy Conditions

*a.* Keep fuel can out of sand.

*b.* Keep float valve free of sand.

*c.* Check for fuel leaks.

## Section VII. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

### 2-19. Special Tools and Equipment

No special equipment is required by operator and organizational maintenance personnel for maintaining the space heater.

### 2-20. Organizational Repair Parts

Organizational maintenance repair parts are listed and illustrated after paragraph 2-42.

## Section VIII. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 2-21. General

To insure that the space heater is ready for operation at all times, it must be inspected systematically so the defects may be discovered and corrected before they result in serious damage or failure. The preventive maintenance checks and services to be performed are listed and described in table 2-1. The item numbers indicate the sequence of inspections.

Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. If a deficiency is found during operation that would damage the equipment, stop the operation of the unit. All deficiencies and shortcomings will be recorded together with corrective action taken, using DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest opportunity.

## Section IX. OPERATOR'S MAINTENANCE

### 2-22. General

This section contains information for the operator maintenance of the space heater. The maintenance includes a visual check, service, and replacement of the heater components.

### 2-23. Guy Lines (Type II and Type I with Conversion Kit installed)

Inspect the guy lines for evidence of frayed, worn, or broken condition. Refer to organizational maintenance for replacement of guy lines.

### 2-24. Draft Diverter (Type II and Type I with Conversion Kit installed)

*a. Removal.* Refer to figure 2-2 and disconnect the guy lines attached to the draft diverter. Remove the draft diverter from the smoke pipe.

*b. Cleaning and Inspection.*

(1) Clean the soot from the draft diverter.

(2) Inspect the draft diverter for holes and clogged condition. Replace a defective draft diverter.

(3) Inspect the guy lines for serviceability. Replace defective lines. Use a double overhand knot to attach the line to the retainer loop of the diverter.

*c. Installation.* Refer to figure 2-2 and install the draft diverter on the smoke pipe and reconnect the guy lines.

### 2-25. Spark Arrestor (Type I without Conversion Kit installed)

*a. Removal.* Refer to figure 2-5 and remove the spark arrestor from the top of the smoke pipe.

*b. Cleaning and Inspection.*

(1) Clean the soot from the spark arrestor.

(2) Inspect the spark arrestor for holes and clogged condition. Replace a defective spark arrestor.

*c. Installation.* Refer to figure 2-5 and install the spark arrestor on top of the smoke pipe.

Table 2-1. Preventive Maintenance Checks and Services

Item Number	Interval				Org	B-Before D-During	A-After operation W-Weekly	Q-Quarterly
	Operator							
	Daily							
	B	D	A	W				
Q					Item to be Inspected	Procedure	Reference	
1	X				X	Type I without Conversion Kit installed	Inspect for proper installation.	para 2-5
2	X		X			Space Heater	Inspect for level condition and that draw grate operates smoothly.	para 2-5 & 2-7
				X		Grate	Inspect for cracked or warped condition and replace as required.	para 2-33
3	X					Air conditioning - heating pipe (smoke pipe).	Inspect pipe sections for security.	para 2-5
		X	X				Inspect pipe joints for loose fit and leaks.	para 2-5
				X			Remove pipe sections for cleaning. Replace as required. Make sure pipe sections fit tight.	para 2-26
4	X					Tent shields	Inspect for proper installation.	para 2-7
5	X		X			Damper	Inspect for proper operation.	para 2-7
6	X					Shovel, shaker and poker (Shaker and poker)	Make sure accessories are available.	
		X	X			Accessories and heater lid	Use sparingly. Make sure accessories and heater lid are available.	
7		X				Ashes and clinkers	Remove every 3 to 4 hours.	para 2-13
			X	X			Remove all ashes and clinkers.	para 2-13
8				X		Spark arrestor	Inspect for accumulation of soot-clear.	para 2-5
9				X		Space heater assy	Apply medium oil to all parts showing signs of rust.	
						Type II and Type I with Conversion Kit installed		
1	X					Oil burner	Inspect for proper installation.	para 2-5
		X		X			Inspect for dirt on burner bottom.	para 2-34
				X			Listen for noisy burner operation.	
				X			Clean soot and carbon from small hole in burner pot.	para 2-34
2	X	X	X			Air conditioning - heating pipe	Clean dirt from bottom of burner.	para 2-34
				X			Inspect pipe sections for security and evidence of leaks.	para 2-5
							Remove pipe sections for cleaning. Replace as required. Make sure pipe sections fit tight.	para 2-26
3	X		X			Damper	Inspect damper for proper operation.	para 2-27
4	X					Float valve	Inspect for level position.	para 2-31
	X	X					Inspect for leaks.	
			X	X			Inspect for secure mounting and that controls are undamaged.	para 2-5
				X			Inspect control for proper operation.	para 2-9
5	X					Tent shields	Remove strainer, clean and replace.	para 2-31
6	X					Guy lines	Inspect for proper installation.	para 2-7
							Adjust guy lines attached to draft diverter.	para 2-23
7	X					Adapter kit	Inspect for proper assembly and leaks.	para 2-28
8	X	X	X			Fuel hoses	Inspect hoses for proper routing.	para 2-30
							Inspect overflow hose for evidence of fuel overflow.	
9	X	X	X	X		Fuel can and hose	Inspect for leaks.	para 2-31
10				X		Space heater assembly	Apply medium oil to all parts showing signs of rust.	para 2-31 & 2-30

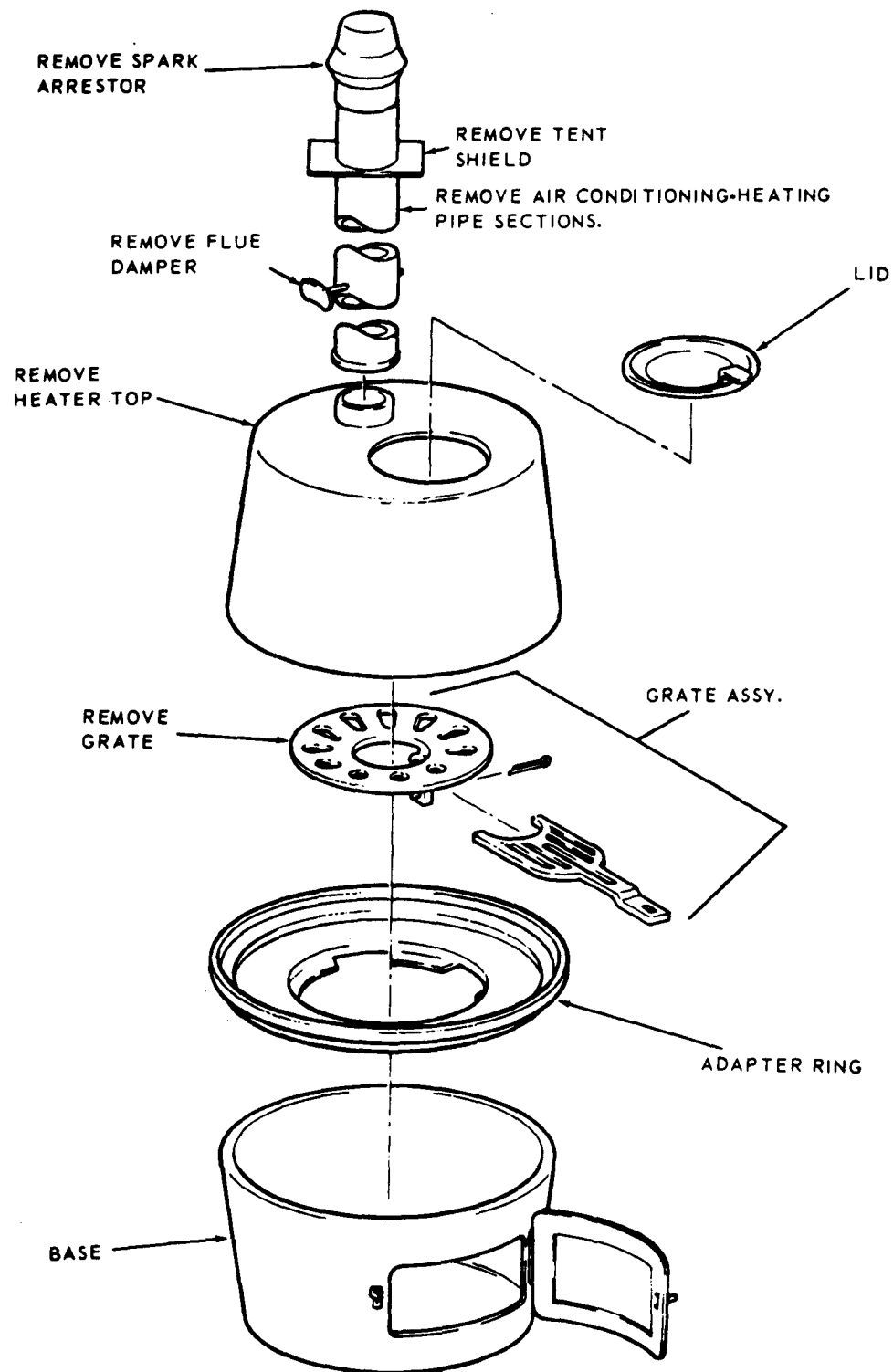


Figure 2-5. Space heater component removal and installation  
(Type I without Conversion Kit installed) (sheet 1 of 2).

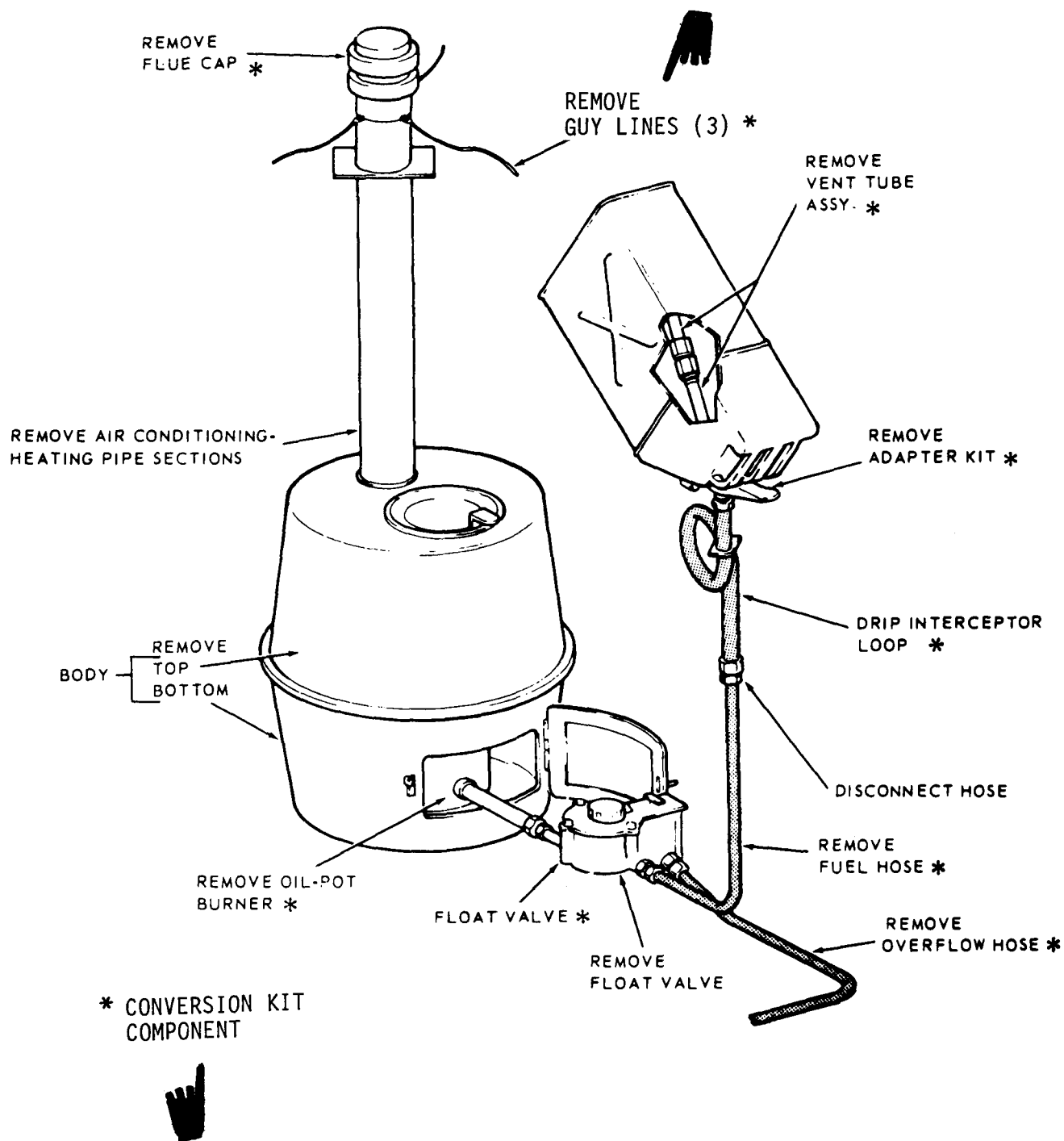


Figure 2.5. Space heater component removal and installation (Type II and Type I with Conversion Kit installed) (sheet 2 of 2).

## 2-26. Air Conditioning-Heating Pipe (Smoke Pipe)

### *a. Removal.*

(1) Remove the guy lines if the draft diverter is installed (para 2-24).

(2) Refer to figure 2-5 and remove the smoke pipe from the tent and space heater.

### *b. Cleaning and Inspection.*

(1) Clean the soot and carbon from the pipe sections.

(2) Inspect the pipe sections for holes and loose fitting joints. Replace any defective pipe sections.

### *c. Installation.*

(1) Refer to figure 2-5 and join the pipe sections forming a single pipe. Install the pipe through the stovepipe shield and attach it to the space heater top.

(2) Reconnect the guy lines if the draft diverter is to be installed (para 2-24).

## 2-27. Flue Damper

### *a. Removal.*

(1) Remove the smoke pipe (para 2-26).

(2) Refer to figure 2-5 and from the bottom pipe section with the fuel damper. Inside the pipe, hold the damper; grasp the damper handle, pressing firmly against the handle, and rotate the damper shaft until the curved shank is unlocked from the damper. The damper shank can now be withdrawn from the pipe.

### *b. Cleaning and Inspection.*

(1) Clean the soot from the damper parts.

(2) Inspect the damper for evidence of wear, cracks, distortion, and for proper operation. Replace a defective damper.

### *c. Installation.*

(1) Install the damper in the lower pipe section of the pipe (para 2-7).

(2) Install the smoke pipe (para 2-26).

## 2-28. Adapter Kit (Type II and Type I with Conversion Kit installed)

*a. Removal.* Refer to figure 2-5 and remove the adapter from the fuel can. Disconnect the fuel hose from the adapter.

### **CAUTION**

Fuel can must be taken down from the support (before releasing the cam) to preclude fuel spillage.

### *b. Inspection.*

(1) Inspect the adapter for damage, proper assembly, fuel leaks, and a defective gasket.

(2) Replace a defective adapter.

*c. Installation.* Refer to figure 2-5 and install the adapter on the fuel can. Reconnect the fuel hose to adapter.

## 2-29. Vent Tube (Type II and Type I with Conversion Kit installed)

### *a. Removal.*

(1) Remove the adapter from the fuel can (para 2-28).

(2) Refer to figure 2-5 and unscrew the vent tube from the adapter.

### *b. Inspection.*

(1) Inspect the vent tube for distortion, damaged threads, and for a restricted condition.

(2) Replace a defective vent tube.

### *c. Installation.*

(1) Refer to figure 2-5 and install the vent tube on the adapter.

(2) Install the adapter on the fuel can (para 2-28).

## 2-30. Hose Assembly (Type II and Type I with Conversion Kit installed)

### *a. Inspection.*

(1) Inspect the overflow hose and fuel hose for deterioration, cuts, leaks, and for a restricted condition.

(2) Replace a defective overflow hose or fuel hose.

*b. Removal.* Refer to figure 2-5 and disconnect the fuel hose and overflow hose from the fuel system.

*c. Installation.* Refer to figure 2-5 and reconnect the fuel hose and overflow hose to the fuel system.

## 2-31. Float Valve (Type II and Type I with Conversion Kit installed)

### *a. Removal.*

(1) Disconnect the fuel hose and overflow hose from the drip valve (para 2-30).

(2) Refer to figure 2-5 and disconnect the float valve from the oil pot burner.

### *b. Inspection and Cleaning.*

(1) Inspect the float valve for evidence of a fuel leak and for a level condition. Inspect the controls for a damaged condition.

(2) Inspect the float valve for evidence of fuel overflow from the overflow port and/or overflow hose.

### *(3) Cleaning.*

(a) Refer to figure 2-6 and unscrew the fuel strainer from the float valve.

(b) Clean drip valve strainer with clean fuel or an approved solvent and reinstall strainer in valve.

(c) Replace a defective float valve assembly.

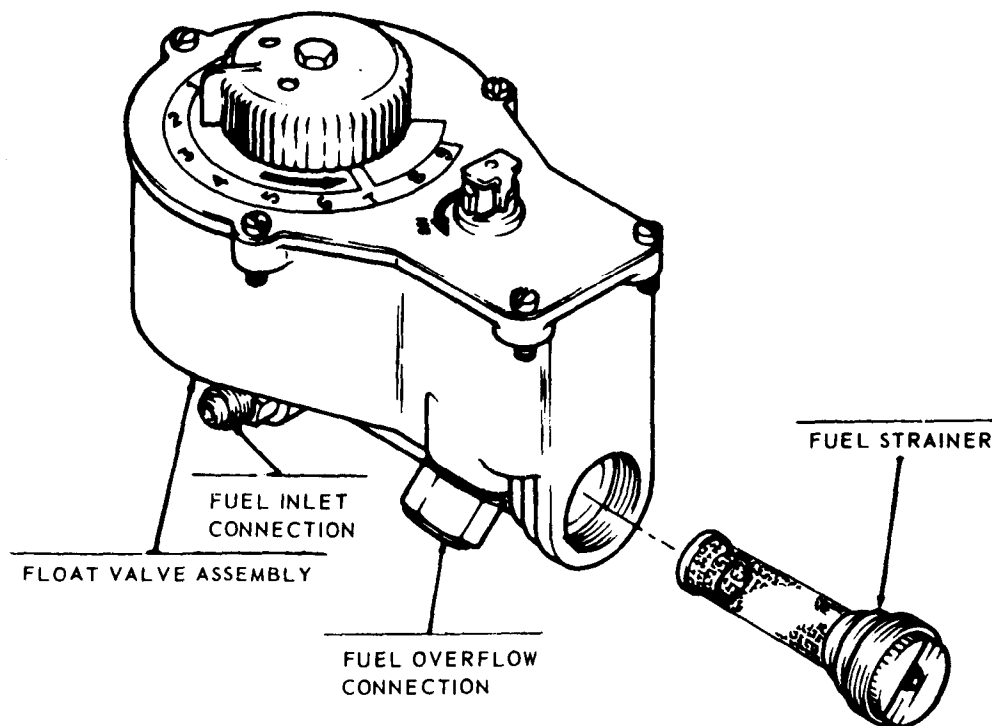


Figure 2-6. Float valve (Type II and Type I with Conversion Kit installed).

*c. Installation.*

- (1) Refer to figure 2-5 and install the float valve on the oil-pot burner.
- (2) Install the fuel hose and overflow hose on the float valve (para 2-30).

## 2-32. Space Heater Top

*a. Removal.*

- (1) Remove air conditioning pipe from space heater top (para 2-26).
- (2) Refer to figure 2-5 and remove the space heater top.

*b. Inspection.*

- (1) Inspect the heater body top for cracks, distortion, and holes burned through metal body.
- (2) Replace a defective space heater top.

*c. Installation.*

- (1) Refer to figure 2-5 and install the heater top.
- (2) Install the air conditioning pipe on the space heater top (para 2-26).

## 2-33. Grate (Type I without Conversion Kit installed)

*a. Removal.*

- (1) Remove the air conditioning pipe from the heater top (para 2-26).
- (2) Remove the space heater top (para 2-32).

- (3) Refer to figure 2-5 and remove the grate from the heater body.

*b. Cleaning.*

- (1) Refer to figure 2-5 and clean grate. Check grate for proper operation.
- (2) Replace a defective grate.

*c. Installation.*

- (1) Refer to figure 2-5 and install the grate in the heater body.
- (2) Install the space heater top (para 2-32).
- (3) Install the air conditioning pipe on the space heater top (para 2-26).

## 2-34. Oil-Pot Burner (Type II and Type I with Conversion Kit installed)

*a. Removal.*

- (1) Remove the air conditioning pipe from the space heater top (para 2-26).
- (2) Remove the space heater top (para 2-32).
- (3) Remove the float valve from the oil-pot burner (para 2-31).
- (4) Refer to figure 2-5 and remove the oil-pot burner from the space heater body.

*b. Cleaning and Inspection.*

- (1) Clean burner, but do not scrape it. Allow a thin layer of carbon to remain on bottom of burner pot. Carbon will protect metal and aid in starting fire.
- (2) Lean small holes in burner pot with match stick or wooden peg.



Caution: Be careful not to enlarge the holes in the burner pot.

(3) Inspect burner pot for excessive accumulation of soot.

(4) Inspect burner pot metal for excessive warping, cracks, and broken spot welds. Replace a defective burner pot.

*c. Installation.*

(1) Refer to figure 2-5 and install the oil-pot burner in the heater body.

(2) Install the float valve on the oil-pot burner (para 2-31).

(3) Install the space heater top on the heater body (para 2-32).

(4) Install the air conditioning pipe on the space heater top (para 2-26).

## 2-35. Space Heater Base

*a. Removal.*

(1) Remove the air conditioning pipe (para 2-26).

(2) Remove the space heater top (para 2-32).

(3) Remove either the grate (para 2-33) or the oil-pot burner (para 2-34).

(4) Refer to figure 2-5 and remove the space heater base.

*b. Inspection.*

Inspect the heater base for cracks, holes, and distortion. Inspect ash door for proper alignment and latch for security.

*c. Installation*

(1) Refer to figure 2-5 and install the heater base.

(2) Install either the grate (para 2-33) or the oil-pot burner (para 2-34).

(3) Install the space heater top (para 2-32).

(4) Install the air conditioning pipe on the heater top (para 2-26).

## Section X. TROUBLESHOOTING

### 2-36. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the space

heater. Malfunctions which may occur are listed in table 2-2. Each malfunction stated is followed by a list of probable causes of trouble. The corrective action recommended is described opposite the probable cause.

*Table 2-2. Troubleshooting*

<i>Malfunction</i>	<i>Probable cause</i>	<i>Corrective action</i>
1. Draw grate locked.	Type I without Conversion Kit installed Clinkers lodged in grate openings.	Remove clinkers as soon as possible. (para 2-13).
2. Stove does not heat properly.	<i>a.</i> Ash door is closed <i>b.</i> Damper blocked or closed.	<i>a.</i> Open ash door. <i>b.</i> Remove pipe and clean damper; open damper (para 2-27)
3. Excessive smoke of dark color.	<i>a.</i> Too much fuel added at one time. <i>b.</i> Accumulation of soot in stack. <i>c.</i> Accumulation of ashes.	<i>a.</i> Reduce quantity of fuel added but add fuel more often. <i>b.</i> Remove and clean stack (para 2-26). <i>c.</i> Shake down fire and clean out ash pit (para 2-13).
1. Burner does not fire.	Type II & Type I with Conversion Kit Installed <i>a.</i> Fuel line to burner clogged. <i>b.</i> Fuel tank empty. <i>c.</i> Float valve inlet knob turned to OFF position. <i>d.</i> Float valve adjustment knob improperly set.	<i>a.</i> Clean out fuel line with compressed air (para 2-30). <i>b.</i> Fill fuel tank. <i>c.</i> Set knob to ON position. <i>d.</i> Reset adjustment knob to correct number.
2. Incomplete combustion.	<i>a.</i> Excess carbon in burner. <i>b.</i> Dirt in fuel.	<i>a.</i> Burn out carbon and do not operate at such a high rate. <i>b.</i> Clean strainer in float valve with an approved cleaning solvent or compressed air (para 2-31).
3. Stove does not heat properly.	<i>a.</i> Dirt in fuel. <i>b.</i> Accumulation of soot in stack. <i>c.</i> Damper stuck. <i>d.</i> Fuel too heavy.	<i>a.</i> Clean strainer in float valve with an approved cleaning solvent or compressed air (para 2-31). <i>b.</i> Clean stack (para 2-26). <i>c.</i> Clean and inspect damper (para 2-27). <i>d.</i> Remove pilot ring from burner.

Table 2-2. Troubleshooting (continued)

Malfunction	Probable cause	Corrective action
4. Any flow of fuel from overflow hose,	a. Valve too far out of level to operate properly. b. Dirt under inlet float needle seat.  c. Float sticks at time.  d. Defective float in valve.	a. Adjust valve level by eye, a level is not necessary. b. Remove valve. Take outside tent, clean strainer and flush out valve. Do not disassemble valve (para 2-31). c. Remove valve and take outside tent. Remove valve cover and check movement of float pivot mechanism. Replace valve if defective (para 2-31). d. Remove cover and check float. If float has any liquid in it, replace valve (para 2-31).

## Section XI. ORGANIZATIONAL MAINTENANCE PROCEDURES

### 2-37. Guy Lines

- a. *Removal.* Refer to figure 2-5 and remove the guy lines from the flue cap.
- b. *Repair.* Replace guy lines as required. Manufacture

guy lines from cotton cord, allowing 15 feet of cord for each line.

- c. *Installation.* Refer to figure 2-5 and attach the guy lines to the flue cap.

## Section XII. SHIPMENT AND LIMITED STORAGE

### 2-38. Preparation of Equipment for Shipment within Zone of Interior

a. *General.* Detailed instructions for the preparation for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

b. *Inspection.* Examine the item for any unusual conditions such as damage or missing components. Inspect the space heater in accordance with steps outlined in Quarterly Preventive Maintenance Services (table 2-1). Deficiencies and shortcomings along with corrective action taken, will be recorded on DA Form 2404 (Refer to DA PAM 738-750).

c. *Cleaning and Drying.* Cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning and drying, types of preservatives, and methods of application are described in TM 38-230.

d. *Depreservation Guide.* Record depreservation instructions on DA Form 2258 or DD Form 1397 as applicable,

e. *Sealing of Openings.* Openings that will permit the direct entry of water into the interior of fuel lines, oil burners, fittings, and float valves, shall be sealed with pressure-sensitive tape conforming to Specification PPP-T-60, Class 1, or covered with waterproof kraft wrapping paper (UU-P-271) secured in place with tape.

f. *Exterior Surfaces.* Coat exposed ferrous metal surfaces with type P-6 preservative (CL) conforming to Specification MIL-C-11796, Class 3. If the preservative is not available, use Automotive and Artillery Grease (GAA).

g. *Marking.* Mark in accordance with MIL-STD-129.

### 2-39. Limited Storage

a. *General.* This paragraph provides instructions for preparation of the space heater for limited storage, not to exceed six months.

b. *Inspection and Maintenance of Equipment in Storage.* When space heaters have been placed in limited storage, all scheduled preventive maintenance services, including inspection, shall be suspended and preventive maintenance inspection shall be performed as specified herein. Perform quarterly preventive maintenance services when the space heater is initially placed in limited storage and every 90 days thereafter. Record all deficiencies and shortcomings, together with corrective action taken, on DA Form 2404. Required maintenance will be performed promptly to insure that the space heater is mechanically sound and ready for immediate use.

### Section XIII. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

#### 2-40. General

When capture or abandonment of the space heater is imminent, the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all space heaters and all corresponding repair parts.

#### 2-41. Demolition to Render the Space Heater Inoperative.

*a. Demolition by Mechanical Means.* Use sledge hammers, crowbars, picks, axes, or any other heavy tool which may be available to destroy the following

##### ■ *Type I without Conversion Kit installed*

- (1) Heater pipe
- (2) Heater body
- (3) Grate

##### ■ *Type II and Type I with Conversion Kit installed*

- (1) Heater pipe
- (2) Heater body

- (3) Float valve
- (4) Oil-pot burner
- (5) Hoses

##### *b. Other Demolition Methods.*

(1) *Scattering and concealment.* Remove all easily accessible components and scatter them through dense foliage, bury them in dirt, or submerge them in a lake, stream, or other body of water.

(2) *Submersion.* Totally submerge the space heater in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

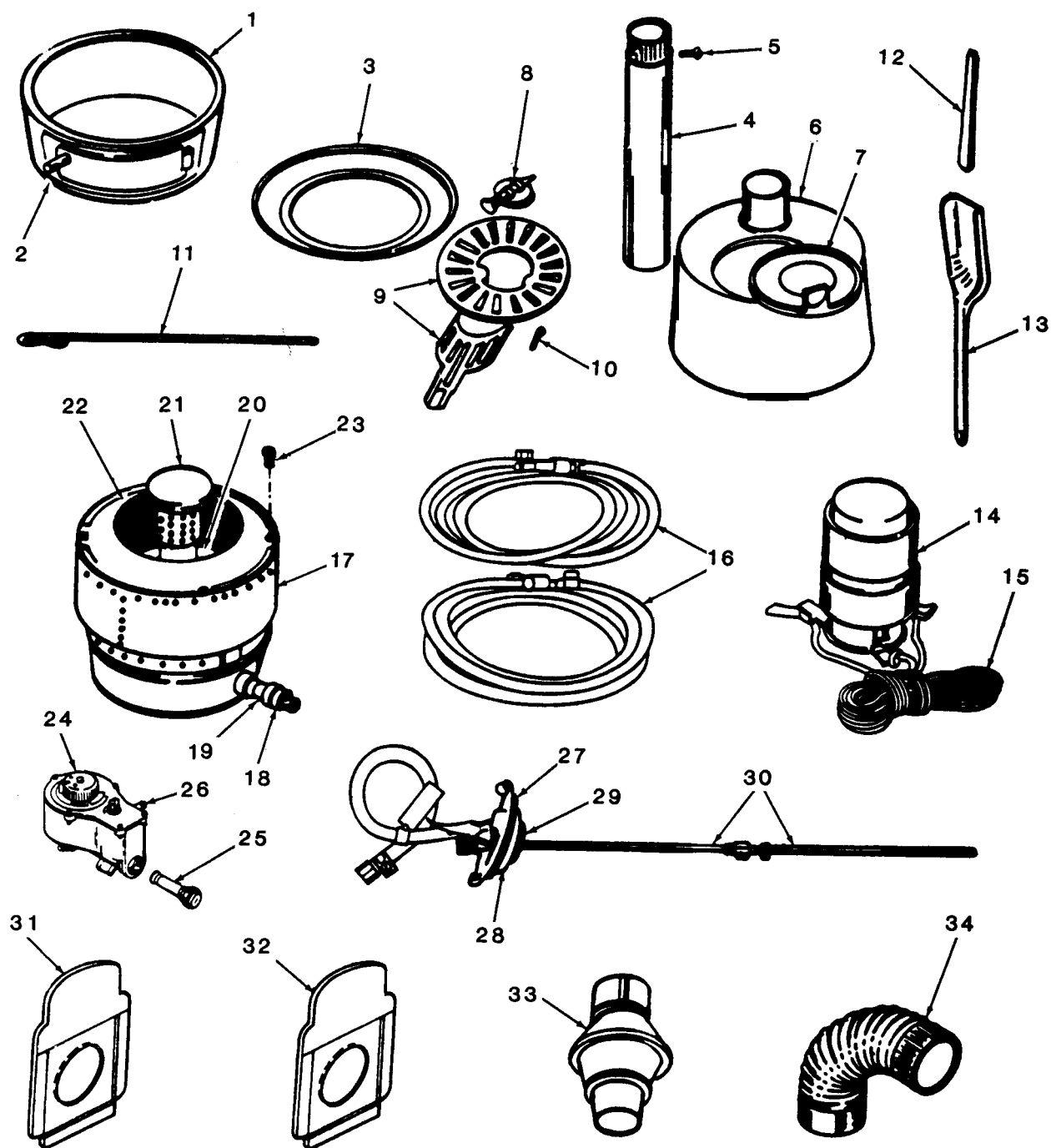
*c. Training.* All operators should receive thorough training in the destruction of the space heater. See FM-5-25. Simulated destruction, using the methods given above, should be included in the operator training program. It must be emphasized in training that demolition operations usually are necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction and be able to carry out instructions without reference to this or any other manual.

### Section XIV. REPAIR PARTS

#### 2-42. General

The following tabular listings comprise the repair parts applicable to the M1941 Type I and Type II tent heaters. Items coded (A) are applicable to Type I without Conversion Kit installed. Items coded (B) are applicable to Type II and

Type I with Conversion Kit installed. All other items are basic to both types. For an explanation of repair parts listings, refer to Chapter 1, Section II of this manual. Refer to figure 2-6 to space heater component identification. ■

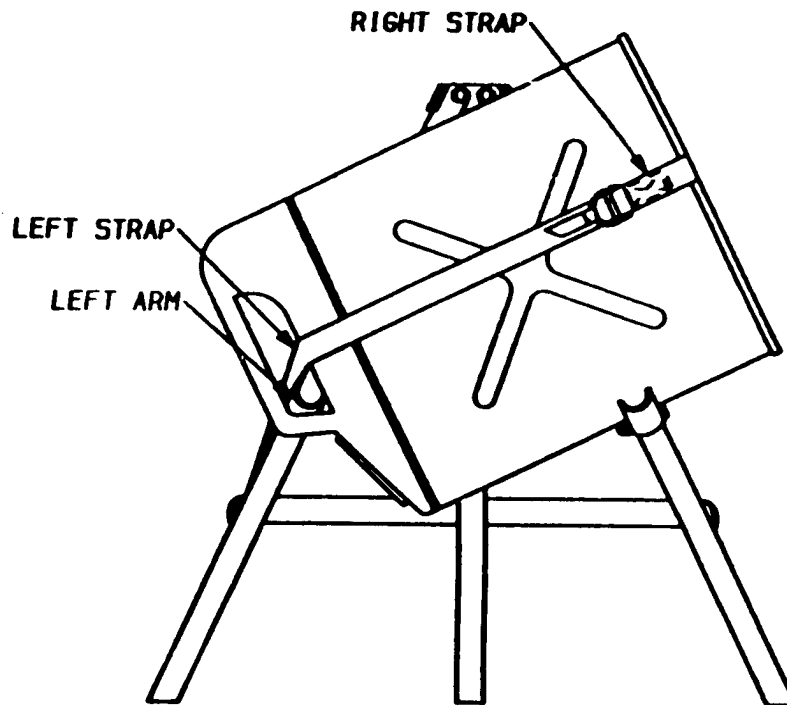


- |                    |               |              |                    |                         |                   |
|--------------------|---------------|--------------|--------------------|-------------------------|-------------------|
| 1 Base             | 7 Lid         | 13 Shovel    | 19 Nipple          | 25 Strainer assy        | 30 Vent tube      |
| 2 Luggage catch    | 8 Damper      | 14 Flue cap  | 20 Pilot ring      | 26 Nipple               | 31 Tent shield    |
| 3 Adapter ring     | 9 Grate assy  | 15 Guy lines | 21 Flame spreader  | 27 Adapter kit          | 32 Tent shield    |
| 4 A/C-heating pipe | 10 Cotter pin | 16 Hose assy | 22 Combustion ring | 28 Gravity feed adapter | 33 Spark arrestor |
| 5 Split rivet      | 11 Poker      | 17 Burner    | 23 Screw           | gasket                  | 34 Elbow          |
| 6 Top              | 12 Shaker     | 18 Reducer   | 24 Float valve     | 29 Preformed packing    |                   |

Figure 2-7. Spare heater components (Type I and Type II).

## STAND ASSEMBLY

1. FULLY EXTEND ALL 3 LEGS UNTIL THEY REACH STOPS.
2. REMOVE LOWER END OF BRACES FROM THEIR LOCKED POSITIONS AND INSERT INTO REAR LEG.



## CAN MOUNTING INSTRUCTIONS

1. PASS LEFT ARM OF STAND THRU CAN HANDLE, KEEPING THE CAN FACING THE GROUND.  
*CAUTION: MAKE SURE ADAPTER GRAVITY FEED IS FULLY SEATED TO AVOID LEAKING.*
2. POSITION LEFT STRAP UNDER LEFT ARM AND ACROSS THE CAN BODY.
3. POSITION RIGHT STRAP ACROSS CAN BODY, RUNNING DOWN TOWARDS THE LEFT STRAP.
4. SECURE LEFT AND RIGHT STRAPS USING "D" RINGS.

Figure 2-8. Fuel Can Stand Assembly (Type II and Type I with Conversion Kit installed).



(1)  \$MR CODE	(2)  FEDERAL STOCK NUMBER	(3)  DESCRIPTION		(4)  UNIT OF MEAS	(5)  QTY INC IN UNIT	(6)  ILLUSTRATION	
		REF NUMBER & MFR CODE	USABLE ON CODE			(a) FIG. NO.	(b) ITEM NO.
		GROUP 01- SPACE HEATER					
PO	7240-360-0094	ADAPTER KIT, GRAVITY: (08288) MSS7240-1	B	ea	1	2-7	27
O	4730-266-0532	ADAPTER, STRAIGHT, PIPE TO TUBE: Inlet	B	ea	1	2-7	
O	4730-288-9930	ADAPTER, STRAIGHT, PIPE TO TUBE: Overflow	B	ea	1	2-7	
PO	4520-153-4616	ARRESTER, SPARK: (81349) MILA1428	A	ea	1	2-7	33
X	4520-555-0944	BASE, SPACE HEATER: (81349) MILH13514		ea	1	2-7	1
PO	4530-277-3247	BURNER: (08288) MSS4530-2	B	ea	1	2-7	17
PO	4520-360-0098	CAP, FLUE: (81337) 2-9-89	B	ea	1	2-7	14
X20	5340-298-7136	CATCH, LUGGAGE: (72795) 59541-4		ea	1	2-7	2
PO	4520-00-153-4602	CONVERSION KIT: (81349) MIL-B-2029	A	ea	1		
PO	4520-288-8650	DAMPER, FLUE: (81337) CJ1033	A	ea	1	2-7	8
PO	4520-272-8659	ELBOW, HEATING: (81377) D5-4-115PIPE		ea	2	2-7	34
PO	5120-293-0450	FIRE SHOVEL, HAND: (08288) MSSS120-9	A	ea	1	2-7	13
PO		GASKET, GRAVITY FEED ADAPTER	B	ea	1	2-7	28
	5330-00-298-7165	For temperatures down to -40°F: (81349) MIL-G-432, Type III, Class 1		ea	1		
	5330-01-271-7621	For temperatures down to -60-F: (81349) MIL-G-432, Type III, Class 2		ea	1		
PO	5330-589-8128	GASKET, STRAINER: (91494) 24257	B	ea	1	2-7	
PO	4520-153-4603	GRATE ASSEMBLY: (81337) 5-11-85	A	ea	1	2-7	9
PO	4720-303-4995	HOSE ASSEMBLY, RUBBER: (81337) 5-14-36	B	ea	2	2-7	16
PO	4520-555-8538	LID: (81337) 5-11-84LID		ea	1	2-7	7
MO		LINES, GUY: 15 ft ea line manufacture from:	B	ft	3	2-7	15
O	4020-233-6555	CORD, COTTON					
O	4730-196-1489	NIPPLE: 3/8 in. x 2 in.	B	ea	1	2-7	19
O	4730-196-1482	NIPPLE, PIPE	B	ea	1	2-7	26
PO	5330-01-172-1251	PACKING, PREFORMED	B	ea		2-7	29
O	6315-234-1672	PIN, COTTER: 5/16 in. x 2 in.	A	ea	1	2-7	10
PO	4520-277-8339	PIPE, AIR CONDITIONING: (08288) MSS4520-3		ea	6	2-7	4
PO	5340-268-7439	POKER: (81337) 2-9-60	A	ea	1	2-7	11
O	4730-595-0772	REDUCER: 3/8 in. x 1/8 in.	B	ea	1	2-7	18
PO	4520-555-8537	RING, ADAPTER: (81337) 5-11-84		ea	1	2-7	3
PO	4530-555-8533	RING, COMBUSTION: (81349) MILB2029		ea	1	2-7	22
PO	4530-555-0946	RING, PILOT, BURNER	B	ea	1	2-7	20
PO	5320-00-010-4448	RIVET, SPLIT: (96906) MS35684-10		ea	12	2-7	5

(1)  SMR CODE	(2)  FEDERAL STOCK NUMBER	(3)  DESCRIPTION		(4)  UNIT OF MEAS	(5)  QTY INC IN UNIT	(6)  ILLUSTRATION	
		REF NUMBER & MFR CODE	USABLE ON CODE			(a) FIG. NO.	(b) ITEM NO.
O	5305-00-854-6689	SCREW, TAPPING, THREAD (08288) MS55305-10	B	ea	4	2-7	23
PO	4520-00-555-8536	SHAKER (81349) MILH13514	A	ea	1	2-7	12
PO	5340-00-153-4615	SHIELD, STOVEPIPE: WITH ELLIPTICAL HOLE (81337) MILS 1484DWGNOC14		ea	1	2-7	32
PO	5340-00-153-4614	SHIELD, STOVEPIPE: WITH ROUND HOLE (81337) 65N02297000		ea	1	2-7	31
PO	8340-00-896-9053	SHIELD, STOVEPIPE (81337) MILS43012		ea	1		
PO	4530-01-094-1928	SPREADER, FLAME (81337) 5-11 -978-4	B	ea	1	2-7	21
PO	7240-01-318-5222	STAND ASSEMBLY, FUEL CAN, 5 GAL/20 LITER (81337) 5-4-5868	B	ea	1	2-8	
PO	5411-01-231-1754	STRAINER, ASSEMBLY (81337) 5-13-1269-2-12		ea	1	2-7	25
X	4520-00-555-8539	TOP, SPACE HEATER (81337) 5-11 -82TOPSTOV		ea	1	2-7	6
PO	4520-00-343-8163	VALVE, FLOAT (81337) 5-13-5130	B	ea	1	2-7	24
PO	7240-00-203-9735	VENT TUBE ASSEMBLY (81349) MILA10957	B	ea	1	2-7	30
PO	5120-00-293-0809	WRENCH, OPEN END: FIXED, DOUBLE HEAD TYPE, 3/8 IN. AND 9/16 IN. WRENCH OPENINGS, 22 DEG, 5-1/8 IN. LG, (81349) MILW10698 SIZE B	B	ea	1		
PO	5120-00-293-2123	WRENCH, OPEN END: FIXED, THIN DOUBLE HEAD TYPE, 1/4 IN. AND 7/16 IN. WRENCH OPENINGS, 22 DEG ANGLE, 4-3/8 IN. LG, (81349) MILW10698	B	ea	1		
PO	5120-00-595-9193	WRENCH, PIPE: V-JAW STYLE, WITH SCREWDRIVER ON ONE END, 7/8 IN. MAXIMUM, IRON PIPE SCREW OPENING, 5 IN. LG. (81349) MILW10698 SIZE E	B	ea	1		

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# CHAPTER 3

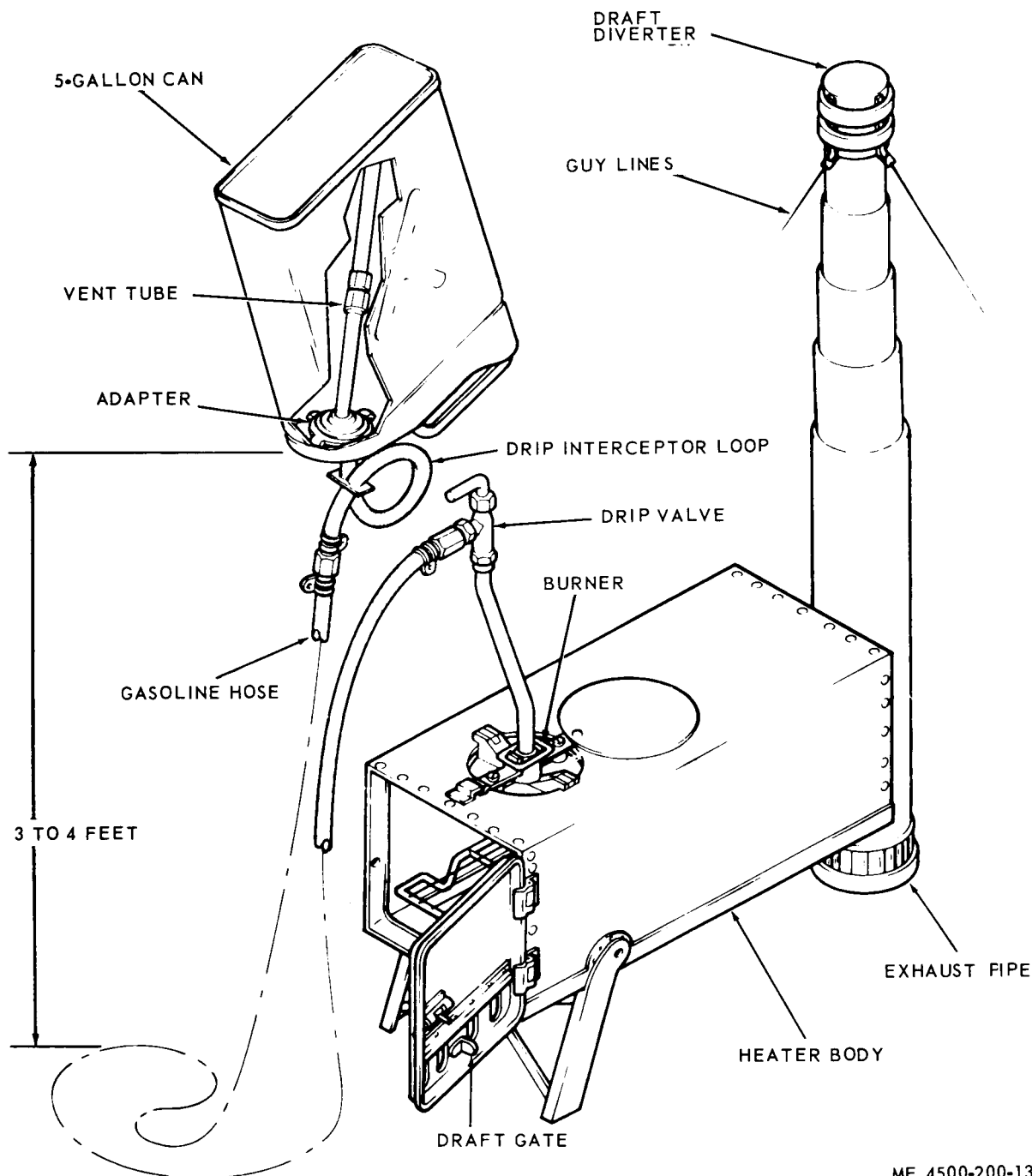
## HEATER, SPACE, RADIANT TYPE, PORTABLE, SOLID/LIQUID FUEL, 60,000 BTU (YUKON M1950) FSN 4520-287-3353

### Section 1. DESCRIPTION AND TABULATED DATA

#### 3-1. Description

a. *General.* Heater model M1950 (fig. 3-1), is designed for heating tents requiring a smokestack no

higher than 8 feet. The heater assembly consists of essentially a heater body, five sections of exhaust pipe, and a burner assembly.



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Figure 3-1. Space heater-installation and liquid fuel conversion.

*b. Fuel.* The space heater will operate on leaded or white gasoline and may be adapted to burn coal or wood.

### 3-2. Tabulated Data

Data for the space heater are tabulated as follows

Model. ....	M1950
FSN. ....	4520-287-3353
Maximum Fuel Consumption (smokeless combustion).....	625 gallons per hour
Heat Output. ....	60,000 BTU (British Thermal Units)

## Section II. INSTALLATION AND OPERATING INSTRUCTIONS

### 3-3. Service Upon Receipt of Materiel

Space heaters are packaged in separate containers to protect them during shipment storage. Container and heater will weigh approximately 33 pounds.

### 3-4. Unpacking the Equipment

*a. General.* The space heater is shipped in a standard type corrugated cardboard box. All components to this heater are stowed within the heater body.

*b. Uncrating.* Remove the heater from the shipping container, being careful not to damage the heater when opening the container.

*c. Depreservation.* Prior to placing the heater in operation, accomplish depreservation in accordance with instructions outlined in DA Form 2258 (Depreservation Guide for Vehicles and Equipment). DA Form 2258 is attached to the heater assembly.

### 3-5. Inspection and Servicing of Equipment

#### *a. Inspection.*

(1) Inspect the entire heater assembly for signs of physical damage.

(2) Inspect the heater to be sure that it is properly assembled, secure, clean, and correctly adjusted.

(3) Correct deficiencies within the scope of organizational maintenance before placing the heater in service.

#### *b. Servicing.*

(1) Perform the daily preventive maintenance services (para 3-17).

(2) Perform the quarterly preventive maintenance services (para 3-17).

### 3-6. Installation of Separately Packaged Components

No separately packaged items are shipped with the heater.

### 3-7. Installation or Setting Up instructions

*a.* Remove the nested exhaust pipe sections, draft diverter, burner assembly, gasoline hose and fuel can adapter from inside the heater body. The wire grate may be left inside the heater,

*b.* Refer to figure 3-1, and install the space heater.

(1) Remove the nested exhaust pipe from the base section, and attach the base section thimble end of the heater by engaging the 3-lug clip band

under the ear clasps surrounding the thimble hole in the heater.

(2) Swing the heater legs down into position and set the heater upright on the tripod support provided by the two legs and the exhaust pipe base section. The heater surface should be level.

(3) Attach the exhaust pipe sections to the base section and extend them upward and outside the tent or shelter. Attach the draft diverter to the top of the exhaust stack. In most tents, this can be accomplished when the base section of the exhaust pipe stack is clipped to the rear end of the heater body. Anchor the three guy lines, leading from the wire loops in the draft diverter, to ground stakes.

#### NOTE

If wood or coal is to be used as fuel, the heater is ready for operation. If gasoline is to be used as fuel, invert the grate in the heater body, and complete the following steps of setting up the heater.

(4) Insert the burner assembly in the burner hole on top of the heater body. Position the burner assembly so that the supporting lugs of the burner cap rest on the edge of the burner hole, and lock the retainers in place by lowering the wire loop back over the ends of the retainers nearest the fuel tube. Turn the burner assembly prior to clamping it so that the offset fuel tube holds the drip valve to one side of the space heater.

#### NOTE

Use V jaw wrench FSN 5120-595-9193 to tighten pipe connections.

(5) Refer to figure 3-1.1, assemble the gasoline can adapter, and insert it in the fuel can.

#### NOTE

To prevent the adapter washer from squeezing out of place, wipe the gasoline off of the washer, washer seat, and lid of the fuel can,

#### CAUTION

The fuel can must be taken down from the support before releasing the cam. This precludes fuel spillage.

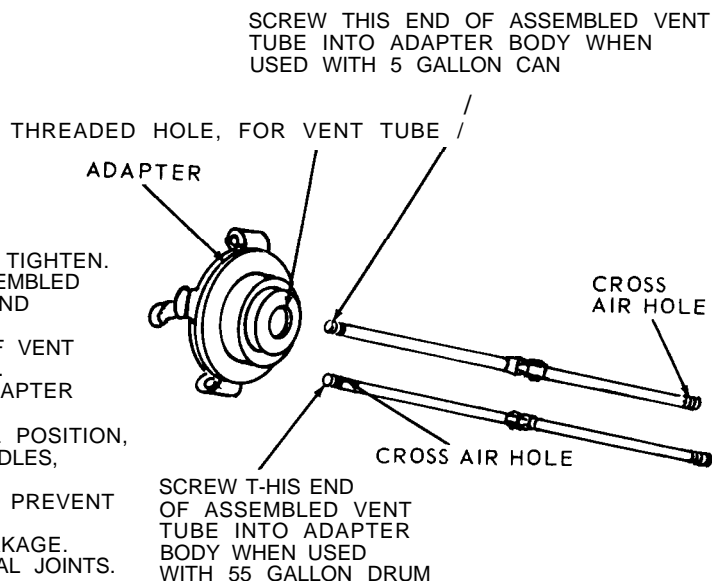
(6) Attach one end of the fuel hose to the drip loop hose attached to the adapter. Attach the other end of the fuel hose to the drip valve of the burner assembly.

### INSTRUCTIONS

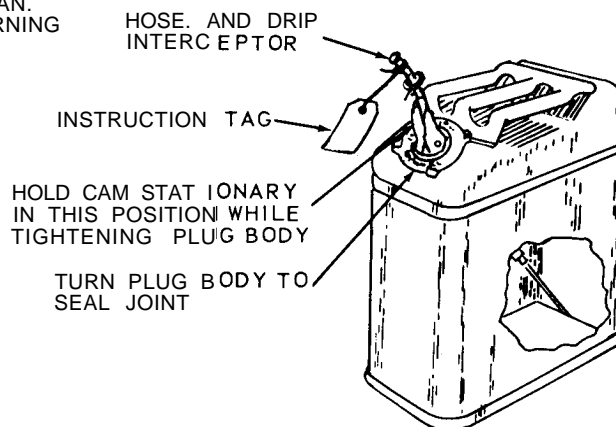
1. ASSEMBLE THE TWO PIECES OF VENT TUBE AND TIGHTEN.
2. FOR 5 GAL. CAN, SCREW THE PLAIN END OF ASSEMBLED VENT TUBE INTO ADAPTER, WITH AIR HOLE AT END FURTHEST FROM ADAPTER BODY.
3. FOR 55 GAL. DRUM, SCREW THE AIR HOLE END OF VENT TUBE INTO ADAPTER BODY WITH PLAIN END OUT.
4. ASSEMBLE HOSE, GASOLINE. SCREW TYPE TO ADAPTER KIT, GRAVITY FEED, AND TIGHTEN.
5. RELEASE CAM AND HOLD CAM FREE IN VERTICAL POSITION.
6. WITH CAM IN FREE POSITION, TOWARDS CAN HANDLES, INSERT ADAPTER IN CAN.
7. HOLD CAM IN FREE POSITION WITH ONE HAND TO PREVENT ROTATION.
8. PRESS CAM DOWN TOWARDS CAN HANDLES TO SEAL JOINTS.

### CAUTION

RELEASE CAM BEFORE REMOVING ADAPTER FROM CAN. DO NOT PERMIT ADAPTER BODY TO TURN WHILE TURNING PLUG BODY.



A. VENT TUBE INSTALLATION



B. FUEL CAN WITH ADAPTER INSTALLED

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Figure 3-1.1 Fuel can adapter installation

(7) Invert the fuel can on a support, such as a tree or a pole, 3 to 4 feet above the ground outside the tent. Some fuel will flow from the vent tube when the fuel can is inverted. Wipe up this excess fuel immediately.

## CAUTION

Insure Drip Valve is closed prior to inverting the fuel container.

## Section III. MOVEMENT TO A NEW WORK SITE

### 3-8. Dismantling for Movement

#### a. *Dismantling.*

(1) Make sure that the heater is clean and free from ashes, soot, and burnt fuel.

(2) Make sure the fuel has been purged from fuel lines, burner, and control valve.

(3) Remove the fuel lines.

(4) If the unit is being moved to another space in the same area, it can be carried.

(5) Stow the pipe sections, burner, hose, and drip valve in the heater body.

b. Reinstallation. After movement, reinstall the space heater at the new work site as directed in paragraph 3-7.

## Section IV. CONTROLS

### 3-9. General

This section describes, locates and furnishes the operator and organizational maintenance personnel sufficient information about the controls used for proper operation of the heater.

### 3-10. Draft Gate

a. Refer to figure 3-1 for the location of the draft gate.

b. When using solid fuel the sliding draft

gate can be adjusted for the amount of fire desired and should be closed for liquid fuel operation.

### 3-11. Drip Valve

a. Refer to figure 3-1 for location of the drip valve.

b. The finely threaded valve stem regulates the rate of flow of gasoline to the burner.

## Section V. OPERATION UNDER USUAL CONDITIONS

### 3-12. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the space heater.

b. The operator must know how to perform every operation of which the space heater is capable. This section gives the instructions on starting and stopping the space heater and on coordinating the basic motions to perform the specific task for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

### 3-13. Starting

#### a. *Preparation for Starting.*

(1) Perform the necessary daily preventive maintenance (para 3-5).

(2) Wipe up any liquid fuel that has leaked or collected in the bottom of the heater.

#### b. *Starting (Liquid Fuel).*

(1) Open the front door wide. Hold a match or other lighted material under the edge of the burner and open the valve, turning counterclockwise about one turn or until burner lights.

## WARNING

Keep face away from the open door when lighting gasoline. The initial flash is likely to occur when the fuel ignites.

(2) Close the door and slide the draft gate shut.

(3) Adjust the drip valve to regulate the fuel feed at the desired rate. Gasoline should drip slowly (viewed through the gage glass) and not flow through the valve.

## NOTE

Do not leave the heater unattended. As fuel level in gasoline can goes down, fuel pressure will drop and will require readjustment of the drip valve to maintain the proper flame.

*c. Starting (Wood or Coal).*

- (1) Stack kindling crisscross over paper on the grate.
- (2) Ignite the paper and close the door.

**NOTE**

Do not use oil or gasoline to start the fire.

(3) When the kindling catches fire, put one shovel of coal or a few sticks of wood on top of the kindling. Coal or wood may be fed to the fire through the burner hole on top or through the door in the front. Keep the burner hole cover plate and front door closed except when refueling the fire.

(4) Regulate the heat output by varying the draft slide opening. To start a coal fire, the draft should be wide open. —

(5) Add coal or wood at intervals necessary to maintain the fire. When adding coal, push the live coals to the rear and add fresh coal at the front. The escaping gases from the fresh coal will be burned off as they pass over the live coals. Add a shovel of coal after each previous shovel of coal starts to burn, until the desired fuel load is reached.

**CAUTION**

Do not build a hotter fire than needed, since the heater body will be in danger of warping if fired heavily.

(6) Clean out the ashes frequently. Do not allow ashes to accumulate below the grate, since hot ashes will warp or melt the grate.

**CAUTION**

In areas of extreme cold, proper ventilation is necessary, in spite of outside temperatures, to prevent the accumulation of noxious gases from the incomplete combustion of the fuel.

**2-14. Stopping**

*a. Liquid Fuel.* To stop burning, close the valve by turning the handle clockwise. Do not force the valve handle. Watch the glass gage until the fuel flow stops.

**CAUTION**

Do not attempt to light the burner while the burner and heater are warm. If the flame is accidentally extinguished, turn the drip valve handle to the OFF position immediately. Allow the burner to cool; wipe up excess fuel from the bottom of the heater before relighting.

*b. Coal or Wood.* Remove burning coal or wood from the stove body.

**Section VI. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE**

**3-15. Special Tools and Equipment**

No special equipment is required by operator and organizational maintenance personnel for maintaining the space heater.

**3-16. Organizational Repair Parts**

Organizational maintenance repair parts are listed and illustrated after paragraph 3-35.

**Section VII. PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

**3-17. General**

To insure that the space heater is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The preventive maintenance checks and services to be performed are listed in table 3-1. The item numbers indicate the sequence of inspection requirements. Defects discovered

during operation of the unit will be noted for future correction to be made as soon as operation has ceased. If a deficiency is found during operation that would damage the equipment, stop the operation of the unit. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

**Section VIII. OPERATOR'S MAINTENANCE**

**3-18. General**

This section contains information for oper-

ator maintenance of the heater. The maintenance includes a visual check of the space

heater assembly, heater installation, servicing, and replacement of heater components.

### 3-19. Guy Lines Inspection

Inspect the guy lines for evidence of a

frayed, worn, or broken condition. Refer to organizational maintenance for replacement of guy ropes.

Table 3-1. Preventive Maintenance Checks and Services

Item Number	Interval						B - Before operation D - During operation			A - After operation W - Weekly			M - Monthly Q - Quarterly		
	Operator				Org										
	Daily				M	Q									
	B	D	A	w											
							Item to be Inspected	Procedure					Reference		
							BODY ASSEMBLY								
1	X		X				Door	Inspect for proper alinement					(para 3-28)		
2	X		X				Grate	Clean carbon from grate					(para 3-27)		
							FUEL SYSTEM								
3	X	X	X		X	X	Kit adapter	Inspect for leaks and damage					(para 3-22)		
4	X				X	X	Vent tube	Inspect tube for looseness and damage to tube threads.					(para 3-23)		
5	X				X	X	Hose assy	Inspect hose for breaks and deterioration.					(para 3-24)		
	X				X	X		Secure hose connections							
							BURNER ASSEMBLY								
6				X	X	X	Burner	Clean carbon deposits from burner body and burner cap.					(para 3-25)		
7		X					Drip valve	Inspect valve for leaks					(para 3-26)		
							EXHAUST SYSTEM								
8			X	X			Exhaust pipe	Inspect for holes and clogged pipe.					(para 3-21)		
			X	X				Clean soot and carbon from pipes							
9			X	X			Flue cap	Inspect for holes and clogged cap					para 3-20)		
10			X	X			Guy lines	Inspect for worn or frayed condition.					(para 3-19)		

### 3-20. Draft Diverter

a. *Removal.* Refer to figure 3-1 and disconnect the guy lines attached to the draft diverter. Remove the draft diverter from the pipe.

b. *Cleaning and Inspection.*

(1) Clean the soot from the draft diverter.

(2) Inspect the draft diverter for holes and clogged condition. Replace a defective draft diverter.

(3) Inspect the guy lines for serviceability. Refer to organizational maintenance for replacement of the guy lines.

c. *Installation.* Refer to figure 3-1 and install the draft diverter on the exhaust pipe and reconnect the guy lines.

### 3-21. Heater Pipe

a. *Removal.* Refer to figure 3-1 and remove the exhaust pipe.

#### NOTE

Compress the telescoping pipe sections into the lower section of the pipe. Rotate the lower section of the pipe to disengage the heater body.

b. *Cleaning, Inspection and Testing.*

(1) Clean the soot and carbon from the pipe sections.

(2) Inspect the pipe section for holes, dents, clogged condition, evidence of rusting, and loose fitting joints. Replace defective pipe sections as required.

c. *Installation.* Refer to figure 3-1 and attach the exhaust pipe sections to the space heater body. Reconnect the guy lines.

### 3-22. Adapter Kit (Liquid Fuel)

#### WARNING

Fuel can must be taken down from the support (before releasing can) to preclude fuel spillage.

a. *Removal.* Refer to figure 3-2 and remove the adapter from the fuel can. Disconnect the fuel hose.

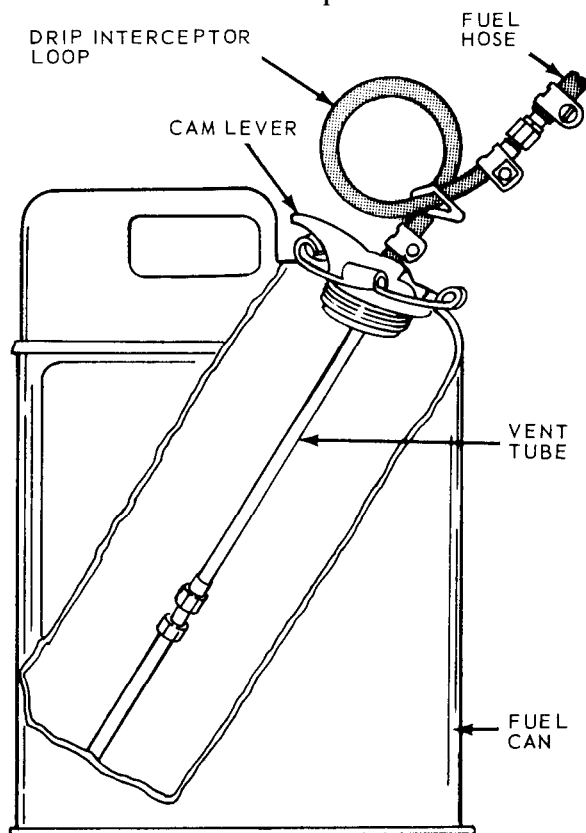
b. *Inspection.*

(1) Inspect the adapter for damage, proper assembly, fuel leaks, and a defective gasket.

(2) Replace a defective adapter.

c. *Installation.* Refer to figure 3-2 and install the adapter on the fuel can. Reconnect

the fuel hose to the adapter.



ME 4500-200-13/3-2

Figure 3-2. Adapter kit and vent tube installation and removal.

### 3-23. Vent Tube

#### a. Removal.

- (1) Remove the adapter from the fuel can (para 3-22).
- (2) Refer to figure 3-2 and unscrew the

vent tube from the adapter.

#### b. Inspection.

- (1) Inspect the vent tube for looseness, distortion, damaged threads, and for a restricted condition.

- (2) Replace a defective vent tube.

#### c. Installation.

- (1) Refer to figure 3-2 and install the vent tube on the adapter.

### 3-25. Burner (Liquid Fuel)

#### a. Inspection.

- (1) Inspect the fuel hose for deterioration, cuts, leaks, and for a restricted condition.

- (2) Replace a defective fuel hose.

b. Removal. Refer to figure 3-1 and disconnect the fuel hose from the drip interceptor loop and the drip valve.

c. Installation. Refer to figure 3-1 and reconnect the fuel hose to the drip interceptor loop and the drip valve.

### 3-24. Hose Assembly

a. Removal. Refer to figure 3-3 and remove the burner assembly from the heater body.

#### b. Cleaning and Inspection.

(1) Clean carbon deposits from the burner body and burner cap with a screwdriver.

(2) Inspect all parts for cracks, breaks, and other damage.

(3) Replace a defective burner.

c. Installation. Refer to figure 3-3 and install the

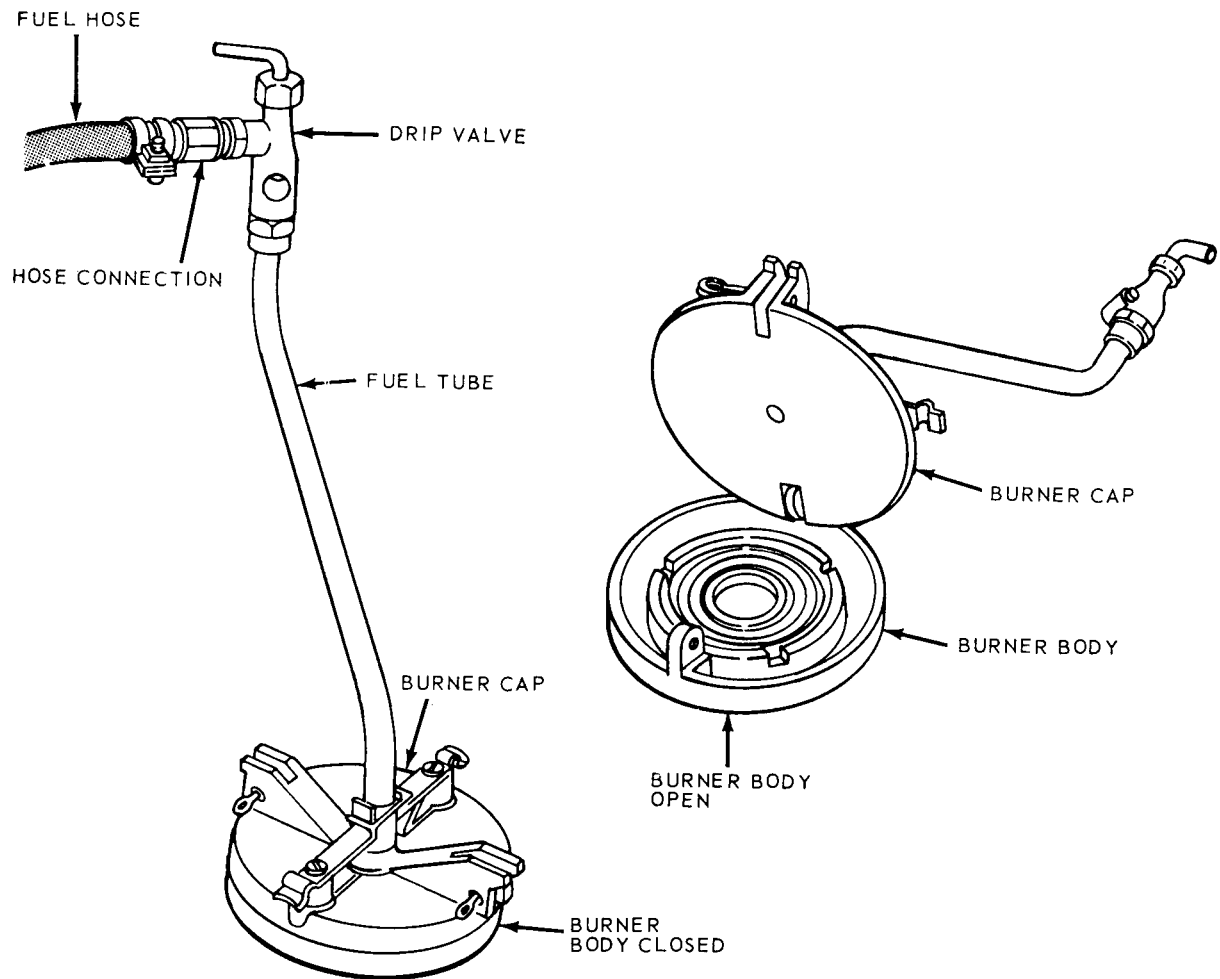


Figure 3-3. Oil burner assembly.





burner on the heater body.

*d. Test.* Light burner to test for proper operation.

### 3-26. Drip Valve

*a. Removal.* Refer to figure 3-3 and remove the drip valve from the burner assembly.

*b. Cleaning and Inspection.*

(1) Clean all parts in clean fuel or unapproved cleaning solvent.

(2) Inspect valve parts for evidence of damaged threads and excessive wear. Inspect sight glass for broken condition.

(3) Replace a defective drip valve.

*c. Installation.* Refer to figure 3-3 and install the drip valve on the burner assembly.

*d. Test.* Light burner to test drip valve for proper operation.

### 3-27. Grate

*a. Removal.* Refer to figure 3-1 and remove the grate from the burner body.

*b. Cleaning.* Clean rust and carbon deposits from grate.

*c. Installation.* Refer to figure 3-1 and install the grate in the heater body.

*Note.* Invert grate in heater body when liquid fuel burner is used.

### 3-28. Body

*a. Removal.*

(1) Remove the burner assembly (para 3-25).

(2) Remove the exhaust stack (para 3-21).

(3) Remove the grate (para 3-27).

*b. Cleaning and Inspection.*

(1) Clean ashes, soot, and clinkers from heater body.

(2) Inspect heater body for broken welds and excessively warped condition.

(3) Inspect door for warped condition and for broken or missing door latch.

(4) Inspect burner hole cover plate for damage.

(5) Inspect folding legs for damaged condition.

*c. Installation.*

(1) Install the grate in the heater body (para 3-27).

(2) Install the exhaust stack (para 3-21).

(3) Install the burner assembly (para 3-25).

## Section IX. TROUBLESHOOTING

### 3-29. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the heater. Malfunctions which may occur are

listed in table 3-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

## Section X. ORGANIZATIONAL MAINTENANCE

### 3-30. Guy Lines

*a. Removal.* Refer to figure 3-1 and remove the guy lines from the flue cap.

*b. Repair.* Replace guy lines as required. Manu-

facture guy lines from cotton cord, allowing 15 feet of cord for each line.

*c. Installation.* Refer to figure 3-1 and attach the guy lines to the flue cap.

## Section XI. SHIPMENT AND LIMITED STORAGE

### 3-31. Preparation of Equipment for Shipment Within Zone of Interior

*a. General.* Detailed instructions for the preparation for domestic shipment are outlined within this

paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

Table 3-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Burner does not fire	a. Fuel line clogged. b. Fuel tank empty. c. Drip valve closed. d. Burner clogged.	a. Clean out fuel line (para 3-24). b. Fill fuel tank. c. Open drip valve. d. Remove and clean burner cap and burner body (para 3-25).
2. Incomplete combustion	a. Excessive carbon on burner.  b. Dirt in fuel.	a. Remove and clean burner cap and burner body (para 3-25). b. Procure clean fuel. Flush fuel lines with clean fuel.
3. Heater does not heat properly	a. Excessive carbon on burner.  b. Accumulation of soot in stack.	a. Remove and clean burner cap and burner body (para 3-25). b. Remove stack, disassemble, and clean (para 3-21).
4. Heater body warped.	Heater too hot.	Reduce amount of fuel fed to fire.

*b. Inspection.* Examine the item for any unusual conditions such as damage or missing components. Inspect the heater in accordance with steps outlined in Quarterly Preventive Maintenance Services (para 3-17). Deficiencies and shortcomings along with corrective action taken will be recorded on DA Form 2404 (TM 38-750).

*c. Cleaning and Drying.* Cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning and drying, types of preservatives, and methods of application are described in T 38-230.

*d. Painting.* Paint surfaces where the paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instruction.

*e. Depreservation Guide.* Record depreservation instructions on DA Form 2258 or DD Form 1397 as applicable.

*f. Sealing of Openings.* Openings that will permit the direct entry of water into interior of the heater shall be sealed with pressure-sensitive tape conforming to Specification PPP-T-60, Class 1, or covered

with waterproof kraft wrapping paper (UU-P-27) secured in place with tape.

*g. Marking.* Mark in accordance with MIL-STD-129.

### 3-32. Limited Storage

*a. General.* This paragraph provides instructions for preparation of the heater for limited storage, not to exceed six months.

*b. Inspection and Maintenance of Equipment in Storage.* When heaters have been placed in limited storage, all scheduled preventive maintenance services including inspection shall be suspended and preventive maintenance inspection shall be performed as specified herein. Perform quarterly preventive maintenance services when the heater is initially placed in limited storage and every 90 days thereafter. Record all deficiencies and shortcomings, together with corrective action taken, on DA Form 2404. Required maintenance will be performed promptly to insure that the heater is mechanically sound and ready for immediate use.

## Section XII. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

### 3-33. General

When capture or abandonment of the heater to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all heaters and all corresponding repair parts.

### 3-34. Demolition to Render the Heater Inoperative

*a. Demolition by Mechanical Means.* Use sledge hammers, crowbars, picks, axes, or any other heavy tool which may be available to destroy the following:

- (1) Exhaust pipe sections.
- (2) Drip valve.
- (3) Burner
- (4) Heater body.
- (5) Grate
- (6) Fuel can and hose.

*b. Other Demolition Methods.*

(1) *Scattering and concealment.* Remove all easily accessible components and scatter them through dense foliage, bury them in dirt, or submerge them in a lake, stream, or other body of water.

(2) *Submersion.* Totally submerge the heater in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

*c. Training.* All operators should receive thorough training in the destruction of the heater. Refer to FM 5-25. Simulated destruction, using methods given above, should be included in the operator training program. It must be emphasized in training that demolition operations usually are necessitated

by critical situations when time available for carrying out destruction is limited. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction without reference to this or any other manual.

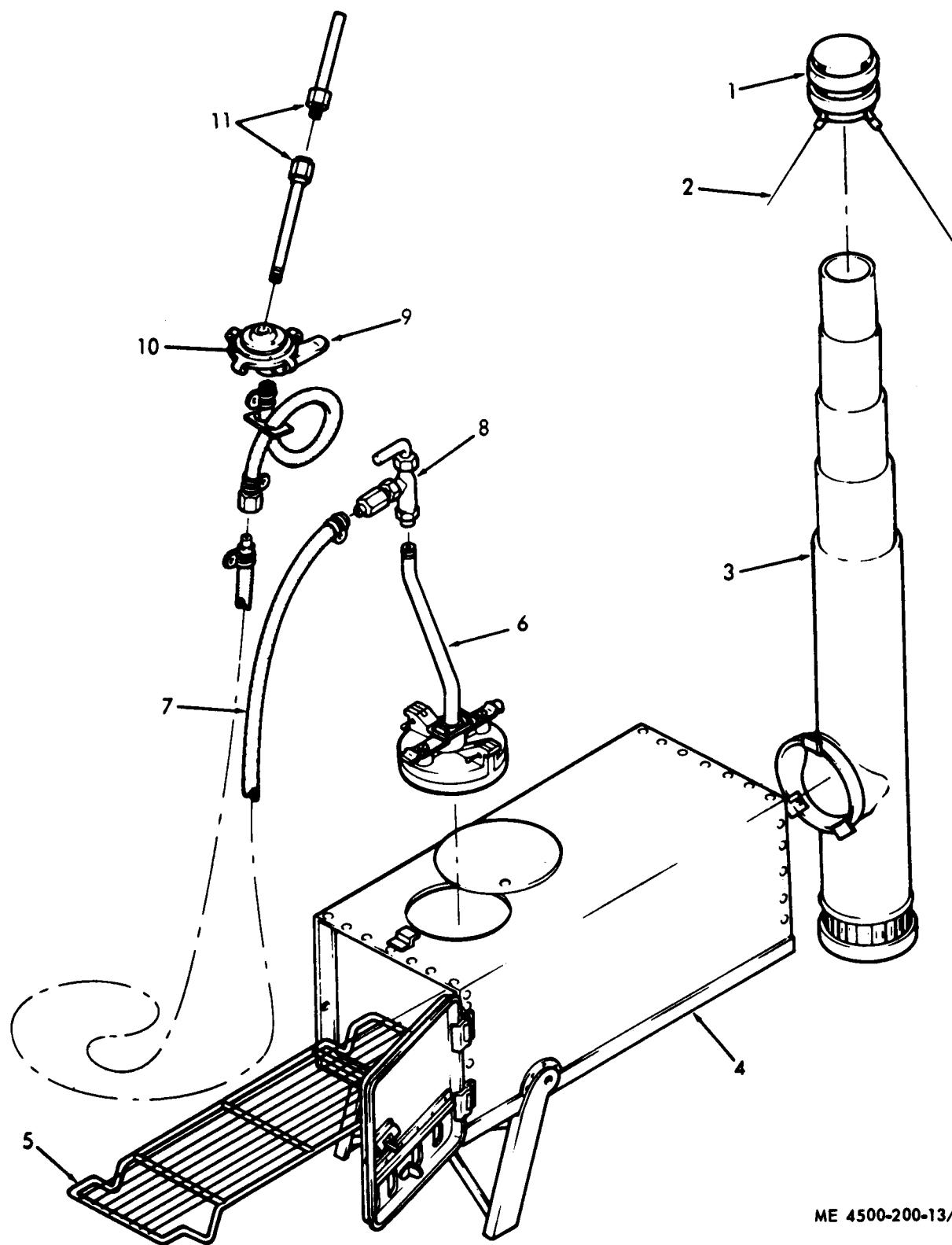
### Section XIII. REPAIR PARTS

#### 3-35. General

The following tabular listings comprise the repair parts applicable to the model M1950 Yukon heater.

For explanation of listings, refer to paragraphs 1-3 through 1-8.

Prescribed Load Allowance Deleted



1 Flue cap  
2 Guy lines  
3 Air conditioning-heating pipe

4 Heater body  
5 Grate  
6 Burner

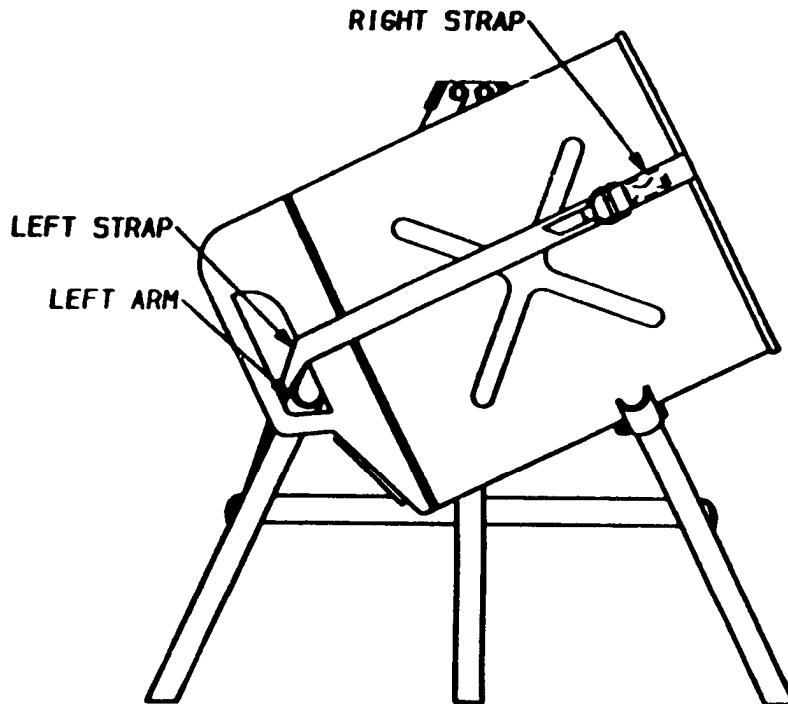
7 Hose  
8 Drip valve  
9 Adapter, fuel can

10 Gasket  
11 Vent tube

Figure 3-4. Space heater components

## STAND ASSEMBLY

1. FULLY EXTEND ALL 3 LEGS UNTIL THEY REACH STOPS.
2. REMOVE LOWER END OF BRACES FROM THEIR LOCKED POSITIONS AND INSERT INTO REAR LEG



## CAN MOUNTING INSTRUCTIONS

1. PASS LEFT ARM OF STAND THRU CAN HANDLE, KEEPING THE CAN FACING THE GROUND.  
*CAUTION: MAKE SURE ADAPTER GRAVITY FEED IS FULLY SEATED TO AVOID LEAKING.*
2. POSITION LEFT STRAP UNDER LEFT ARM AND ACROSS THE CAN BODY.
3. POSITION RIGHT STRAP ACROSS CAN BODY, RUNNING DOWN TOWARDS THE LEFT STRAP.
4. SECURE LEFT AND RIGHT STRAPS USING “D” RINGS.

Figure 3-5. Fuel Can Stand Assembly.

(1) SMR code	(2) National stock number	(3) Description  Ref number & Mfr code	(4) Unit of meas	(5) Qty inc in unit	(6) Illustration	
					(a) Fig. No.	(b) Item No.
		GROUP 01 - SPACE HEATER				
PO	7240-00-360-0094	ADAPTER KIT, GRAVITY (08288) MSS7240-1	ea	1	3-4	9
X		BODY ASSEMBLY, SPACE HEATER	ea	1	3-4	4
PO	4520-00-540-6168	BURNER ASSEMBLY, SPACE HEATER (81349) MILS12340A	ea	1	3-4	6
PO	4520-00-360-0098	CAP, FLUE (81337) 2-9-89	ea	1	3-4	1
PO	5330-01-172-1182	GASKET, GRAVITY, FEED ADAPTER (01212) 635293-C83	ea	1	3-4	10
PO	4520-00-272-7692	GRATE, SPACE HEATER (81337) MILS12340	ea	1	3-4	5
PO	4720-00-303-4995	HOSE ASSEMBLY, RUBBER (08288) 5-14-36	ea	1	3-4	7
MO		LINES GUY: 15 FT EA LINE MANUFACTURE FROM:	ft	3	3-4	2
O	4520-00-233-6555	CORD, COTTON				
PO	5330-01-172-1251	PACKING, PREFORMED (01212) 602060-C83	ea	1	3-4	10A
PO	4520-00-277-8342	PIPE, AIR CONDITIONING (81349) MILH12340A	ea	1	3-4	3
PO	7240-01-318-5222	STAND ASSEMBLY, FUEL CAN, 5 GAL/20 LITER (81337) 5-4-5868	ea	1	3-5	
PO	7360-00-559-6874	VALVE, DRIP (81349) MILC1588	ea	1	3-4	8
PO	7240-00-203-9735	VENT TUBE ASSEMBLY: CONSISTS OF UPPER AND LOWER VENT TUBE, WITH CONNECTOR, PLUG AND NUT (81349) MILA10957	ea	1	3-4	11
PO	5120-00-293-0809	WRENCH, OPEN END: FIXED, DOUBLE HEAD TYPE, 3/8 IN. AND 9/16 IN. WRENCH OPENINGS, 22 DEG, 5-1/8 IN. LG, (81349) MILW10698 SIZE B	ea	1		
PO	5120-00-293-2123	WRENCH, OPEN END: FIXED, THIN DOUBLE HEAD TYPE, 1/4 IN. AND 7/16 IN. WRENCH OPENINGS, 22 DEG ANGLE, 4-3/8 IN. LG, (81349) MILW10698	ea	1		
PO	5120-00-595-9193	WRENCH, PIPE: V-JAW STYLE, WITH SCREWDRIVER ON ONE END, 7/8 IN. MAXIMUM, IRON PIPE SCREW OPENING, 5 IN. LG. (81349) MILW10698 SIZE E	ea	1		
PO	4520-01-202-4520	Y4KIT (18789) LOOP (18789) Y4-4 RETAINER, BURNER (18789) Y4-5 PIN, COTTER (18789) Y4-6 SCREW, SELF-TAPPING (18789) Y4-7	ea ea ea ea	1 2 2 2	3-4 3-4 3-4 3-4	6A 6B 6C 6D

# INDEX - FEDERAL STOCK NUMBER AND REFERENCE NUMBER CROSS - REFERENCE TO INDEX NUMBER

<u>STOCK NUMBER</u>	<u>INDEX NO.</u>	<u>STOCK NUMBER</u>	<u>INDEX NO.</u>	<u>STOCK NUMBER</u>	<u>INDEX NO.</u>
4520-01-202-4520				5330-01-172-1182	00006
4520-233-6555	00009	4720-303-4995	00008	5330-01-172-1251	00006A
4520-272-7692	00007	5120-293-2123	00014	7240-203-9735	00012
4520-277-8342	00010	5120-595-9029	00013	7240-360-0094	00002
4520-360-0098	00005	5120-595-9193	00015	7360-559-6874	00011
4520-540-6168	00004				
<u>REFERENCE NO.</u>	<u>MFG CODE</u>	<u>INDEX NO.</u>	<u>REFERENCE NO.</u>	<u>MFG CODE</u>	<u>INDEX NO.</u>
MILA10957	81349	00012	MILW10698SIZEB	81349	00013
MILC1588	81349	00011	MILW10698SIZEE	81349	00015
MILH12340A	81349	00010	MSS7240-1	08288	00002
MILS12340	81337	00007	Y4-4	18789	00016
MILS12340A	81349	00004	Y4-5	18789	00016
MILW10698	81349	00014	Y4-6	18789	00016
			Y4-7	18789	00016
			2-9-89	81337	00005
			5-14-36	08288	00008
			602060-C83	01212	00006
			635293-C83	01212	00006A



## CHAPTER 4

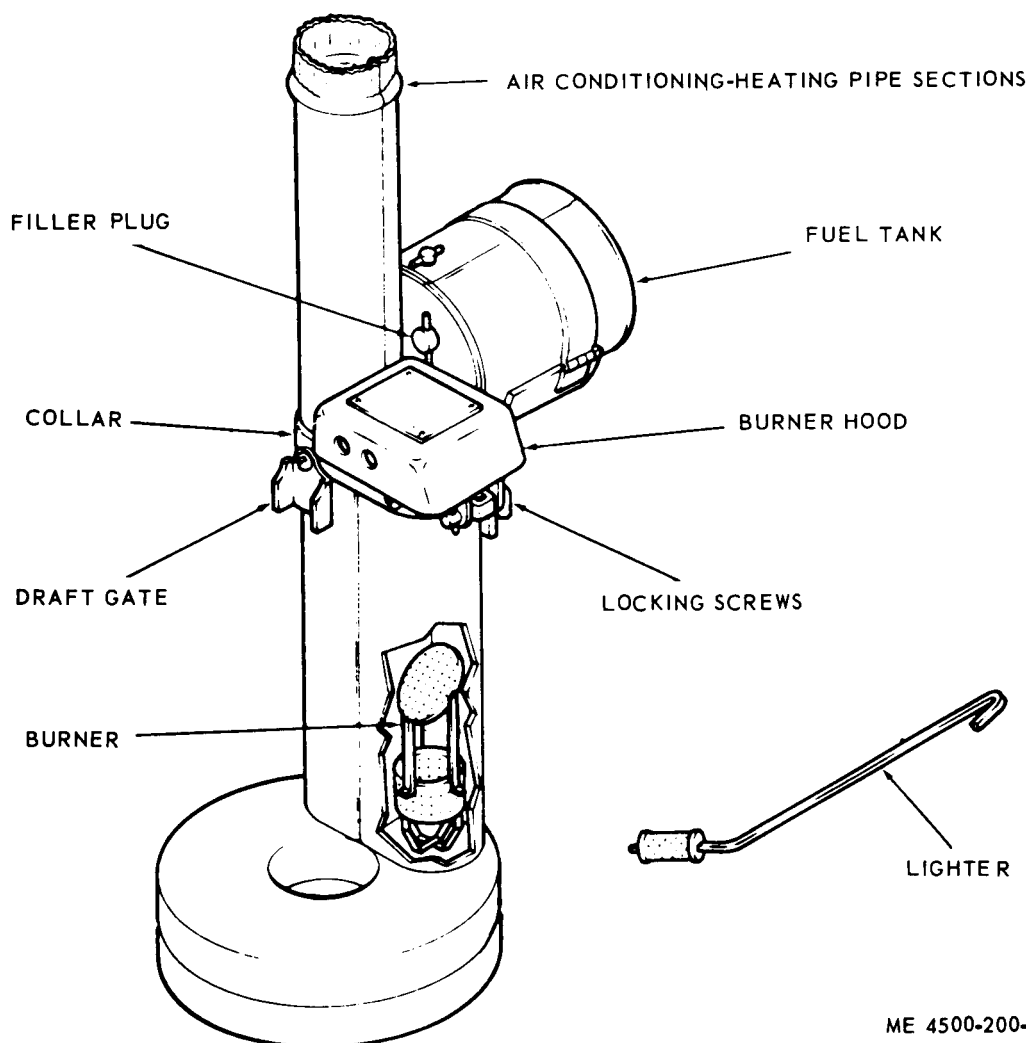
# HEATER, IMMERSION LIQUID FUEL FIRED, FOR CORRUGATED CANS FSN 4540-266-6835 AND MODEL 447-2EX FSN 4540-453-9146

## Section I. DESCRIPTION AND TABULATED DATA

## 4-1. Description

a. *General.* Since both immersion heater models are similar in appearance, illustration configurations displayed throughout this chapter are consistent with immersion heater FSN 4540-266-6835. Minor differences in models are described in paragraph 4-3. The corrugated can heater body (fig. 4-1) is of watertight, sheet-steel construction and consists of a doughnut-shaped combustion chamber and a stack assembly welded together. A vertical partition (fig. 4-2) divides the stack into two compartments; the burner compartment which houses the burner, and the flue compartments through which

combustion gases leave the heater. The partition between the two stack compartments extends to the bottom of the heater and causes air entering the chamber from the burner compartment to circulate completely around the chamber before leaving by way of the flue compartment. The swing type draft gate on immersion heater, FSN 4540-266-6835, is located on the side of the flue compartment, near the top. The hanger is a length of bar steel welded to the body of the heater. It is bent to fit the rim of the can and is provided with two clamping hook bolts to insure mounting on the can. An instruction plate is located on the hinged hood (fig. 4-1) which



ME 4500-200-13/4-1 C3

Figure 4-1. Immersion heater, corrugated can (FSN 4540-266-6835)  
(Model 447-2EX).

covers the top of the burner compartment. The vaporizer plate of the downdraft burner consists of a 3/32 inch layer of absorbent asbestos, sandwiched between two perforated ovals of corrosion-resistant steel. The fuel tank is held in place by a cradle and strap assembly. The fuel tank is equipped with a valve assembly, a vent plug, and a filler plug, all located on the same end of the cylindrical tank. The heater is equipped with an 8-foot air-conditioning pipe that consists of four sections of pipe (fig. 4-1). The perforated cylinder on the end of the lighter is filled with absorbent asbestos.

b. Fuel. The immersion heater utilizes leaded or white gas as its normal fuel.

4-2. Tabulated Data

Capacities	
Fuel tank . . . . .	2.2 gallons
Heatoutput. . . . .	35,000 British Thermal Units
Cubage, crated . . . . .	5.6 cubic feet
Diameter:	
Combustion chamber . . . . .	15 inches
P i p e . . . . .	4 inches

Length:	
Burner . . . . .	12 3/8 inches
Heater only . . . . .	30 inches
Heater with fuel tank . . . . .	33 3/4 inches
Heater with pipe sections . . . . .	9 feet 8 inches
Weight:	
Complete . . . . .	44pounds
Crated . . . . .	60 pounds

4-3. Difference in Models

Both immersion heater models are essentially the same in construction and for application. However, the primary difference lies in the method in which each heater is preheated and ignited. To light the immersion heater, FSN 4540-266-6835, a lighter torch must be manually inserted first in the flue compartment and then into the burner compartment. Model 447-2EX, immersion heater provides a lighter cup which is mechanically pivoted inside the burner compartment. The lighter cup pivot arm forms a handle and extends outside the burner compartment. The operator need only to move the handle to pass the lighter cup from flue compartment to burner compartment.

Section II. INSTALLATION AND OPERATING INSTRUCTIONS

4-4. Service Upon Receipt of Materiel

a. Inspection and Servicing the Equipment.

(1) Inspection.

(a) Inspect the entire heater assembly for signs of physical damage.

(b) Inspect the heater to be sure that it is properly assembled, secure, clean, correctly adjusted, and for evidence of fuel leaks.

(c) Correct deficiencies within the scope of organizational maintenance before placing the heater in service.

(2) Servicing. Perform the preventive maintenance services (para 4-18).

4-5. Installation of Separately Packaged Components

No separately packaged items are shipped with the heater.

4-6. Installation or Setting Up Instructions

a. Location. Select a site that is level and as sheltered as possible.

b. Setting Up.

(1) Refer to figure 4-2, and assemble the immersion heater.

NOTE

Use V jaw wrench FSN 5120-595-9193 to tighten the pipe connections.

(2) Refer to figure 4-2 and install the fuel tank in the cradle strap assembly, and secure it with the wingnuts (or chained knurled nuts) provided.

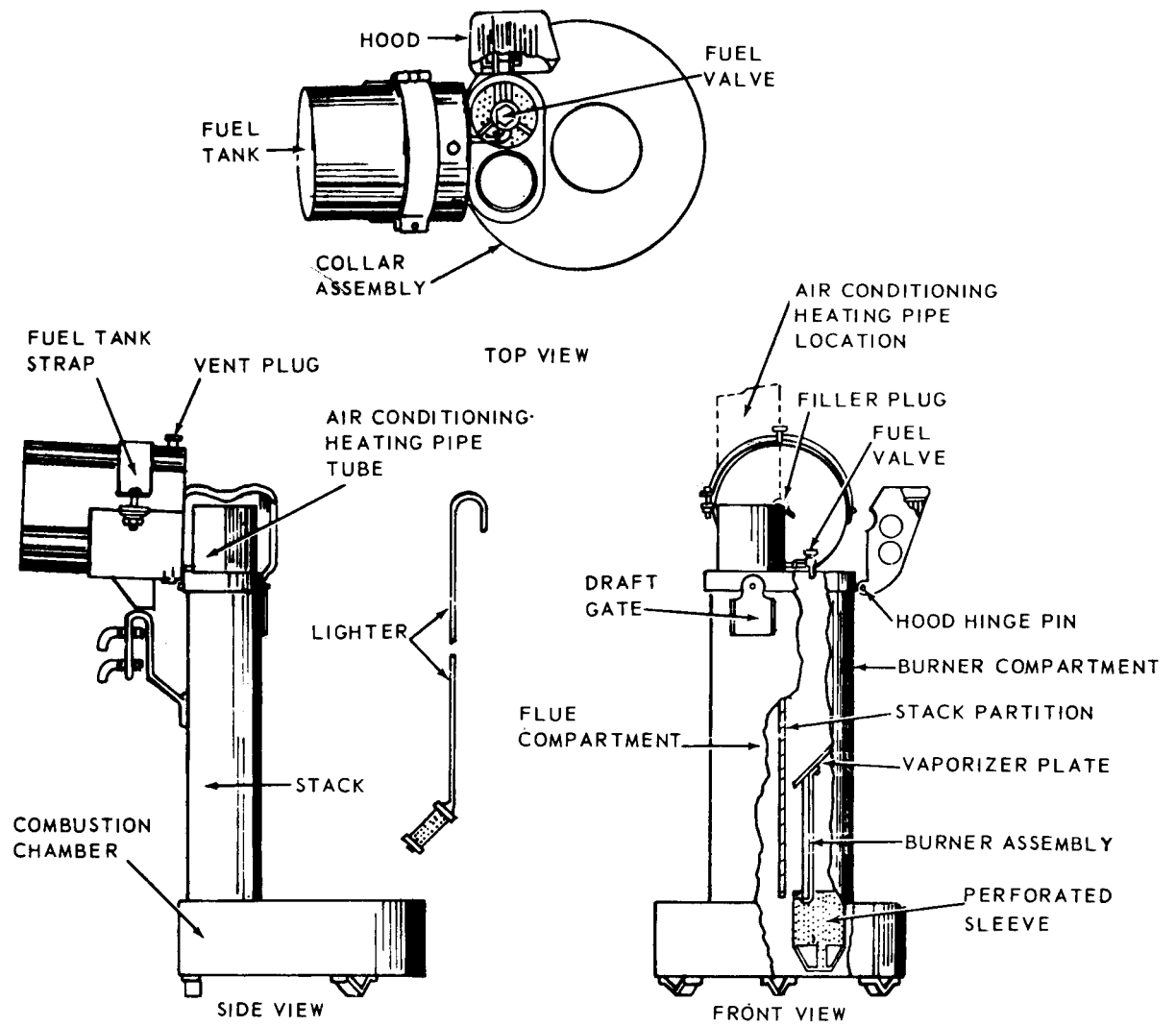
CAUTION

Do not attempt to install the heater with a full tank of fuel because the balance will be destroyed and cause the heater to fall.

(3) Refer to figure 4-2, and install the burner in the burner compartment with the vaporizer plate end facing up.

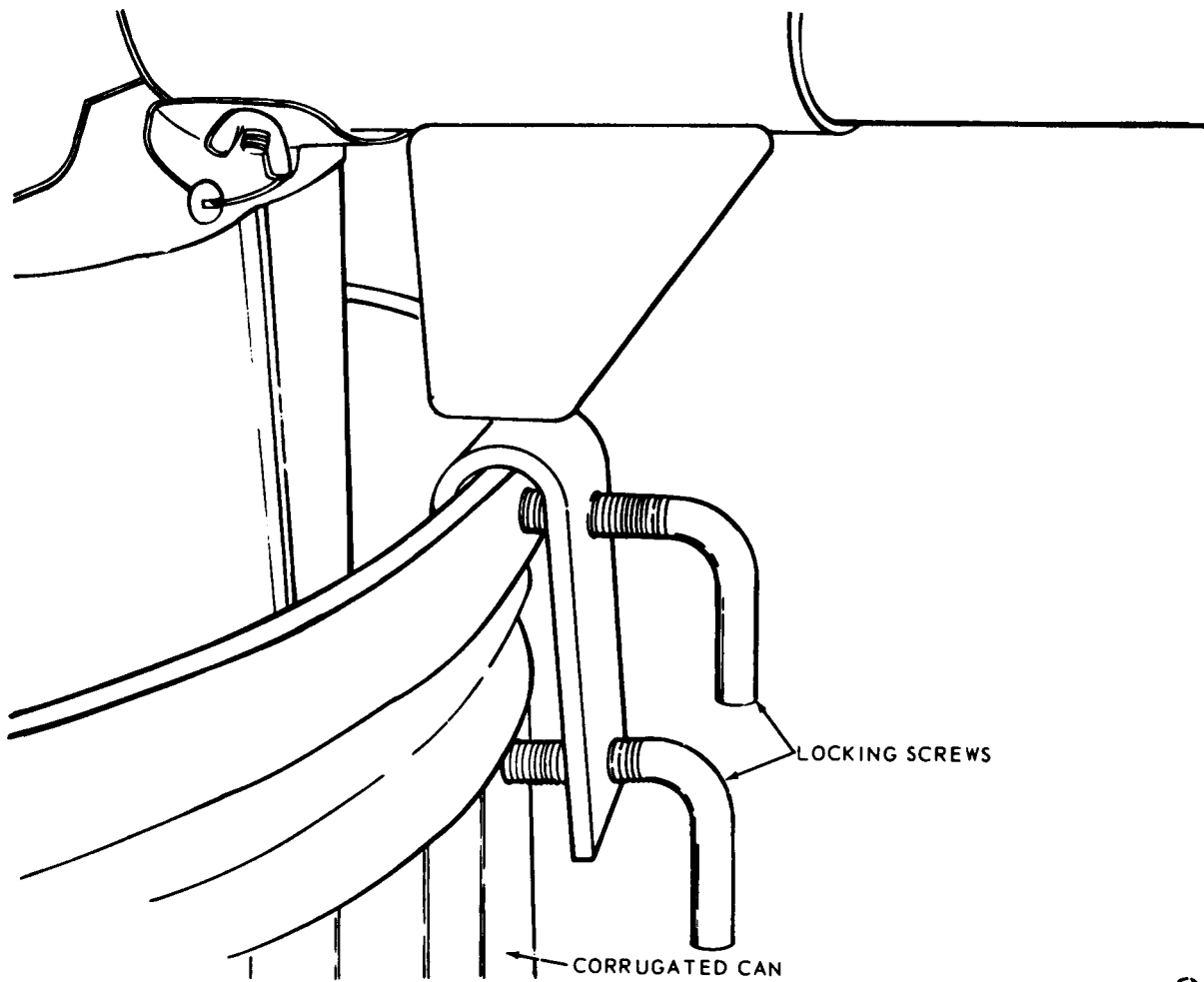
(4) Refer to figure 4-2, attach the heater to the can and tighten the locking screws or thumbscrews.

(5) Refer to figure 4-2, and attach the four 2-foot sections of air-conditioning-heating pipe to the collar of the heater. Fill the can with water to within 6 inches below the collar assembly of the heater.



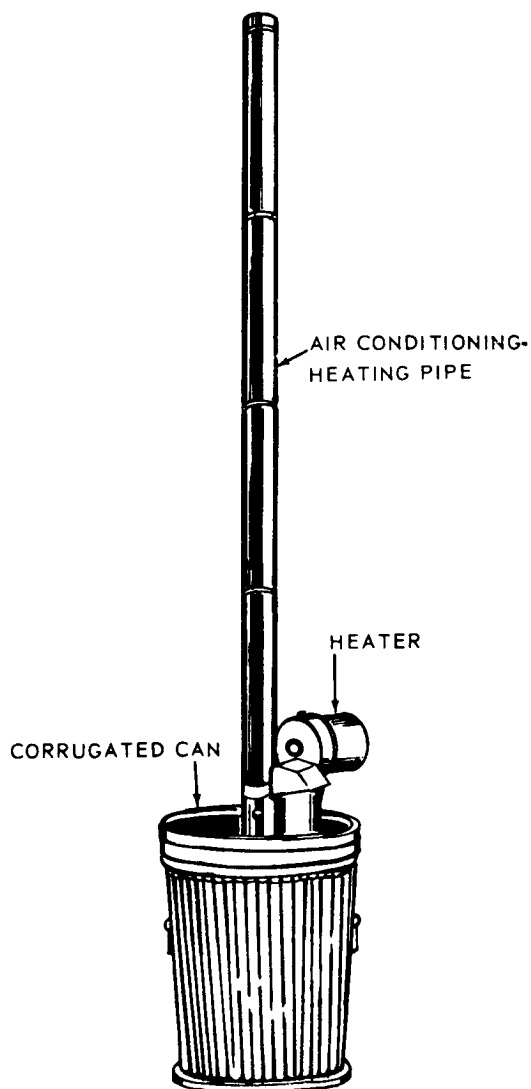
ME 4500-200-13/4-2 (1)

Figure 4-2. Immersion heater installation (FSN 4540-266-6835)  
(Model 447-2EX) (sheet 1 of 3).



ME 4500-200-13 4-2 (2)

*Figure 4-2. Immersion heater installation (heater locking screws)  
(sheet 2 of 3).*



ME 4500-200-13/4-2 (3)

Figure 4-2. Immersion heater installation (heater installed in can  
(sheet 3 of 3).

### Section III. MOVEMENT TO A NEW WORK SITE

#### 4-7. Dismantling for Movement

##### a. Dismantling.

- (1) Remove stack and separate into sections.
- (2) Remove fuel tank from heater.
- (3) Remove heater from can.
- (4) Clean soot from pipe sections and burner

(5) If unit is being moved to another space in the same area, it can be hand carried.

b. *Reinstalling after Movement.* Reinstall the immersion heater at the new work site as directed in paragraph 4-6.

## Section IV. CONTROLS

### 4-8. General

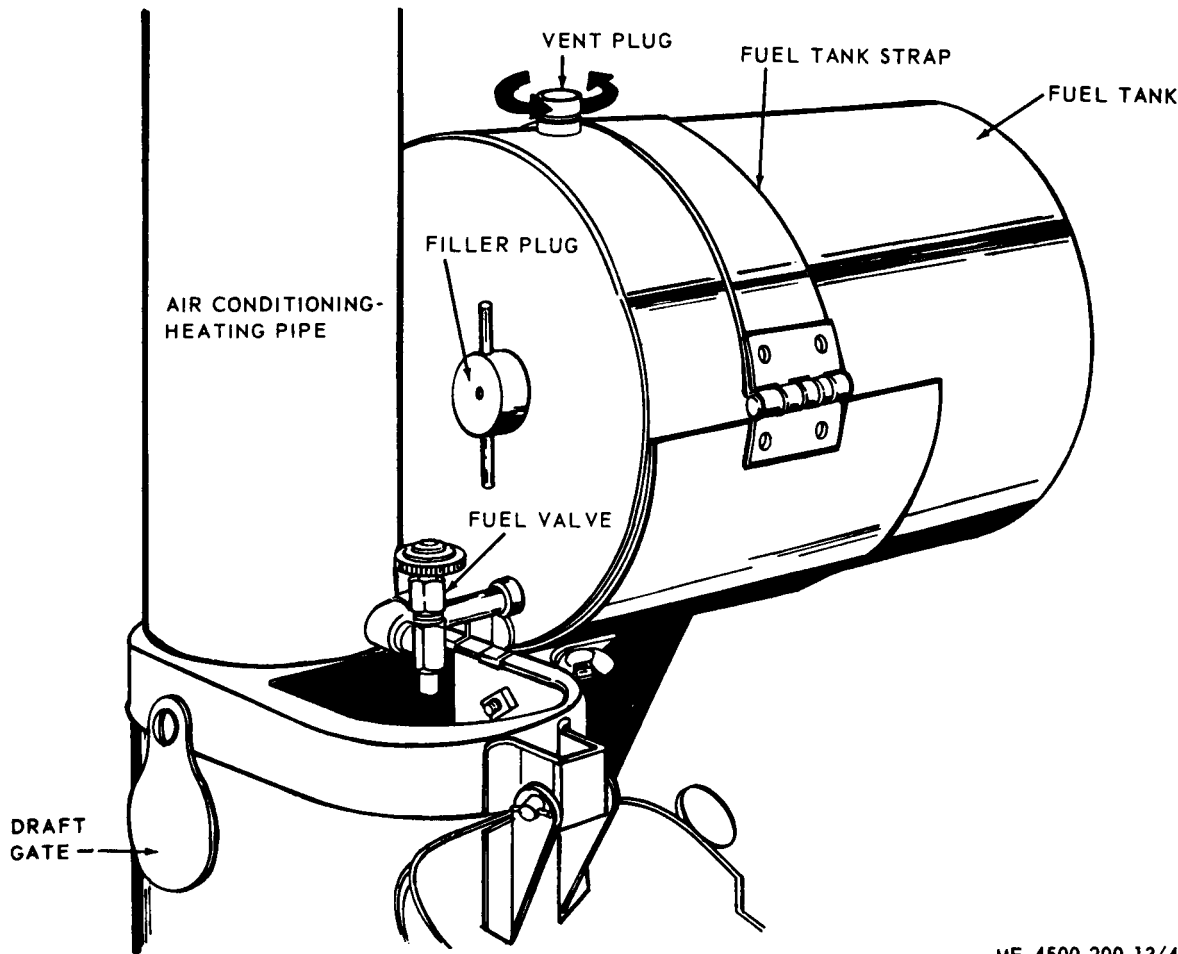
This section describes the various controls and provides the operator/crew sufficient information to insure proper operation of the immersion heater. Controls are identical for all models.

### 4-9. Controls

Refer to figure 4-3 for the location of each control.

*a. Fuel Valve.* The fuel valve is located on a short pipe nipple extending from the fuel tank. Adjust valve as described in paragraph 4-11.

*b. Vent Plug.* The vent plug is located on top of the fuel tank. When preheating the flue, unscrew vent plug as far as possible without forcing it and leave it unscrewed as long as the heater is in operation.



ME 4500-200-13/4-3

Figure 4-3. Immersion heater controls (FSN 4540-266-6835)  
(Model 447-2EX).

## Section V. OPERATION UNDER USUAL CONDITIONS

### 4-10. General

*a.* The instructions in this section are published for the information and guidance of personnel responsible for operation of the immersion heater.

*b.* The operator must know how to perform every operation of which the immersion heater is capable. This section gives instructions on starting and stopping the immersion heater and on coordinating the

basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

### 4-11. Starting

*a. Preparation for Starting.* Perform the before-operation services, paragraph 4-4.

b. *Preheat Flue.* Immersion heater FSN 4540-260-6835.

- (1) Open vent plug as far as possible.
- (2) Soak lighter in a mixture of half gasoline and half engine oil. Do not saturate lighter by holding it under the fuel drip valve.
- (3) Use a match to ignite lighter.
- (4) Swing draft gate to one side and insert burning lighter into flue compartment. The heat from the lighter causes a draft down the burner compartment, around the combustion chamber, and up and out the flue compartment.
- (5) Remove lighter in about 2 minutes and close the draft gate.

c. *Preheating Flue Model 447-2EX.*

- (1) Open vent plug at top of fuel tank and swing lighter cup below drip valve.
- (2) Open drip valve until lighter cup is 1/4 full of gasoline.
- (3) Ignite fuel in lighter cup and return cup for preheating of flue. Allow lighter cup to burn in fuel for approximately 1 minute.

d. *Starting Immersion Heater (FSN 4540-266-6835).*

- (1) Immediately after preheating the flue, place

the burning lighter on top of the vaporizer plate.

(2) Wearing a glove on the hand, open fuel valve slightly and allow fuel to drip on vaporizer plate (fig. 4-5).

(3) Adjust fuel valve until fuel flows in rapid drops but not in a fine stream.

(4) Leave lighter in burner compartment until its flame burns out and then remove the lighter.

(5) Make final adjustment of fuel valve to obtain flame desired.

(6) Close hood and leave it closed during operation

(7) Check for and wipe up any spilled fuel  
e. *Starting Model 447-2EX.*

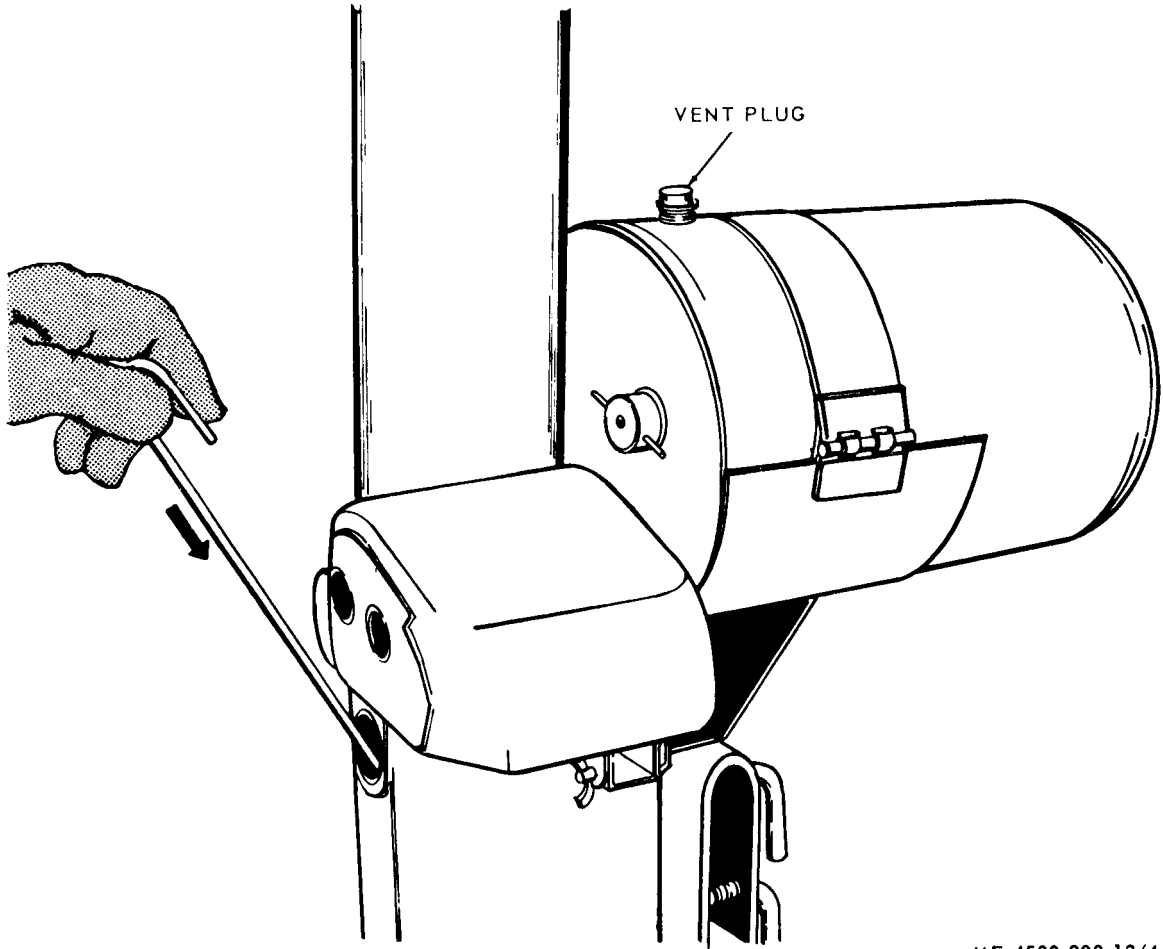
(1) After 1 minute, swing burning lighter cup so that edge is below drip valve.

(2) Open drip valve and stream will ignite from burning lighter cup.

(3) Swing lighter cup back to flue.

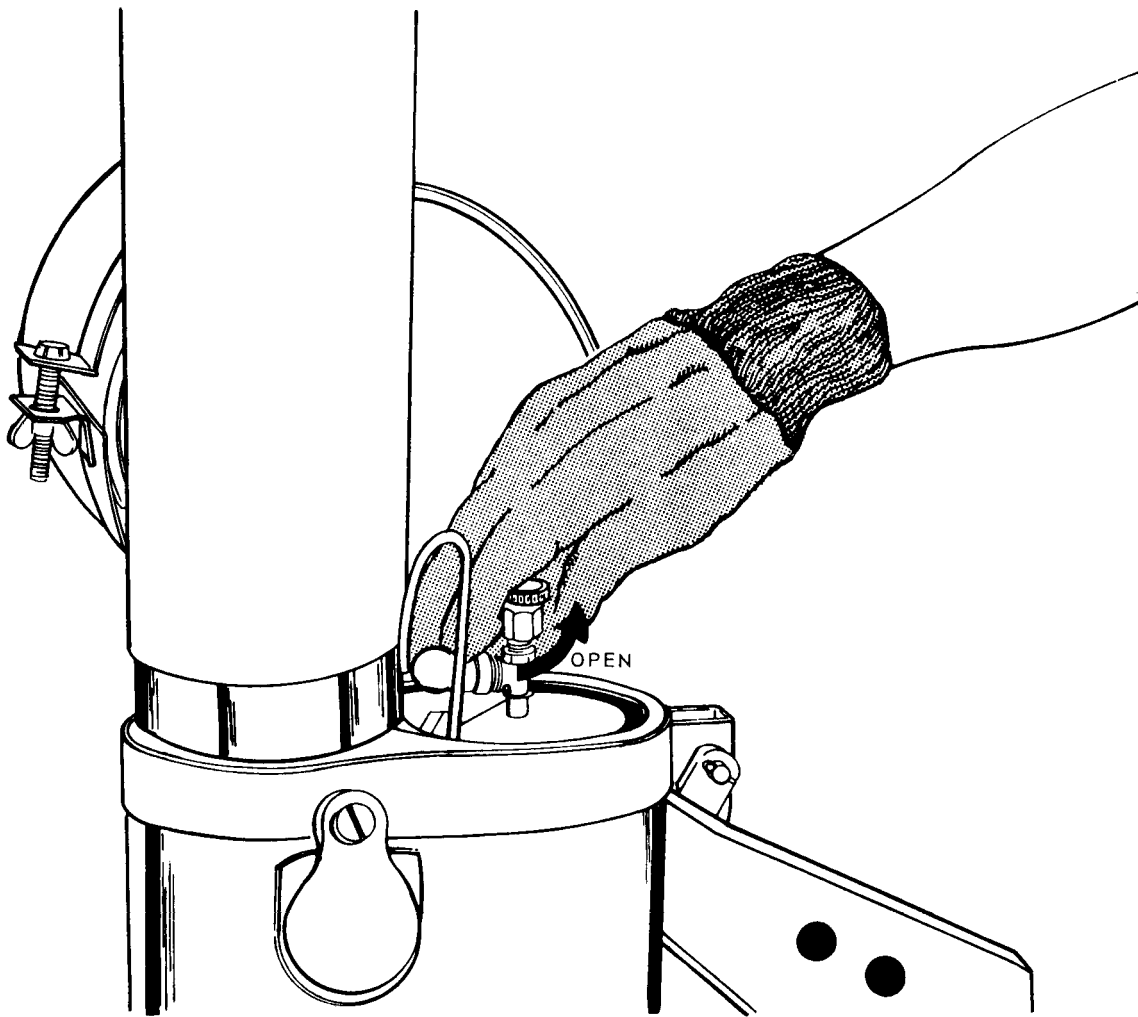
(4) Adjust fuel flow to just below smoke point.

**Caution: Do not expose face to burner chamber while lighting.**



ME 4500-200-13/4-4

Figure 4-4. Preheating flue



ME 4500-200-13 '4-5

Figure 4-5. Lighting burner and adjusting fuel valve.

#### 4-12. Stopping

- a. Refer to figure 4-5, close fuel valve and figure 4-4, close vent valve.
- b. Remove stack and fuel tank from heater assembly. Remove heater from can and turn upside down so

that any accumulated fuel in the combustion chamber can drain out.

- c. Perform after-operation services, paragraph 4-18.

### Section VI. OPERATION UNDER UNUSUAL CONDITIONS

#### 4-13. Extreme Cold

- a. During extremely cold weather, operate heater in a shelter if possible. Be sure to pipe exhaust fumes outside.
- b. If heater must be operated outside, provide a windbreak such as a tent, building, truck, or tarpaulins.
- c. Leave burning lighter in the flue compartment for 4 or 5 minutes instead of the usual 2 minutes when preheating the flue.

#### 4-14. Extreme Heat

- a. Exercise great care in lighting and operating heaters in extreme heat because of rapid evaporation of the fuel under these conditions.
- b. Under tropical conditions, remove condensation from heaters with dry cloths to keep the equipment as free possible of moisture.

#### 4-15. Heavy Rain

- a. Up-end the heater before each operation to drain any water from combustion chamber.



- b. Protect the heater with an overhead shelter whenever possible.
- c. Do not expose the burner to moisture. The asbestos

layer in the burner will absorb water and this will interfere with the operation of the heater.

## Section VII. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE

### 4-16. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for maintenance of the immersion heater.

### 4-17. Organizational Repair Parts

Organizational maintenance repair parts are listed after paragraph 4-38.

## Section VIII. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 4-18. General

To insure that the immersion heater is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result

in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in table 4-1.

## Section IX. OPERATOR'S MAINTENANCE

### 4-19. General

Paragraphs 4-20 through 4-23 contain information for the operator's maintenance of the immersion heater. The maintenance includes a visual check of the assembly.

### 4-20. Heater Body

#### a. Inspect.

(1) Refer to figure 4-6 and inspect heater body for dents or broken welds. Report broken welds to direct support maintenance.

(2) Inspect stack partition for holes or broken welds. Broken welds and holes in stack partition should be reported to direct support maintenance.

#### b. Cleaning.

(1) Refer to figure 4-6 and clean dust and grease off heater body.

(2) Use fine sandpaper to rub off rust spots.

(3) Remove scale using Scale Removing Compound (NSN 6850-00-637-6142).

(a) Set up the heater in a 32-gallon (121.12-liter) can and fill the can with water. Add 5 cups (1.18 liters) of compound and stir until dissolved.

(b) Fire up the heater and heat the solution for 30 minutes. Check the color of the solution and look for remaining scale. If the solution is yellow and there is still scale on the heater, add 5 more cups (1.18 liters) of compound and heat for another 30 minutes.

(c) When the solution remains red or pink and the scale is gone, turn off the heat and pour out the solution. Rinse thoroughly with fresh water.

Table 4-1. Preventive Maintenance Checks and Services

Item Number	Interval					B - Before operation	A - After operation	Q - Quarterly
	Operator				Org	D - During operation	W - Weekly	
	Daily							
	B	D	A	W	Q	Item to be inspected	Procedure	
1	X		X			Fuel Tank	Be sure fuel tank is filled with correct fuel.	Para 4-1
2	X	X				Heater Assembly	Inspect for proper installation.	Para 4-4
3	X	X				Installation	Be sure fumes are piped outside if heater is to be operated in a building or tent.	Para 4-13
4	X					Combustion Chamber	Inspect for broken welds and holes. Check combustion chamber to be sure there is no unburned fuel in it.	Para 4-36 Para 4-6 and 4-12
5	X					Fuel	Inspect for leaks or spilled fuel.	Para 4-4
6	X					Water Level	Check water level.	Para 4-6
7	X	X				Vent Plug	Inspect control,	Para 4-9
8		X				Fuel Valve	Adjust fuel flow.	Para 4-11
9			X		X*	Heat Body	Inspect for clean condition. Clean and remove scale quarterly.	Para 4-20
10				X		Burner	Inspect and service.	Para 4-21
11			X			Air Conditioning Pipe	Service and inspect.	Para 4-22
12			X			Vent Plug Gasket	Inspect.	Para 4-23
13					X	Fuel Tank Strap Cradle	Inspect.	Para 4-29
14					X	Burner Hood	Inspect.	Para 4-26
15					X	Draft Gate	Inspect.	Para 4-25
16					X	Valve Assembly	Service.	Para 4-31
17					X	Lighter Cup, Wick and Wick Retainer	Inspect.	Para 4-32

\* Scale is removed quarterly by operator.

- 1 Air conditioning-heating pipe
- 2 Tank, fuel
- 3 Gasket, vent plug
- 4 Plug, filler
- 5 Wingnut
- 6 Strap, fuel tank
- 7 Wingnut
- 8 Nipple
- 9 Elbow
- 10 Valve
- 11 Pin, hinge
- 12 Hood, burner
- 13 Pin, cotter
- 14 Burner
- 15 Bolt, hook
- 16 Bolt, hook
- 17 Pin, cotter
- 18 Plate, backup
- 19 Lighter, burner torch
- 20 Screw
- 21 Nut
- 22 Draft gate
- 23 Collar
- 24 Heater body
- 25 Pin, cotter
- 26 Spring
- 27 Lighter cup assembly
- 28 Retainer, wick
- 29 Wick
- 30 Body, heater
- 31 Cradle assembly

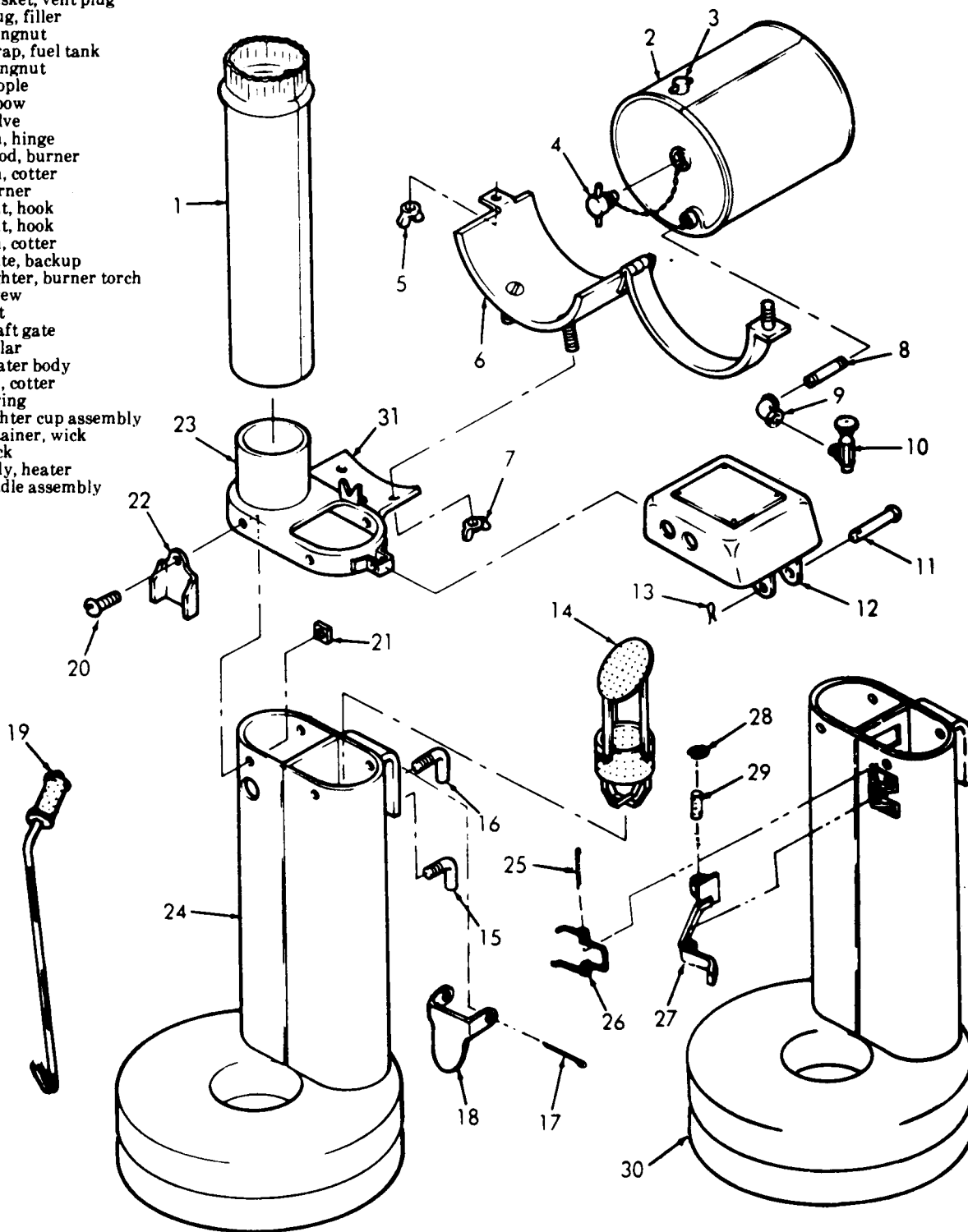


Figure 4-6. Immersion heater-exploded view (FSM 4540-266-6835)  
(Model 447-2EX).

#### 4-21. Burner

##### a. Inspection.

(1) Refer to figure 4-7 and inspect the burner for excessive corrosion.

(2) Inspect for damage such as distortion, cracks, and breaks. Inspect asbestos filler for deterioration.

(3) An opening of any size or shape in either flue partition or the baffle in the base of the heater should not be considered a safety hazard. No adverse condition will occur if an opening is present. Depending of the size and location of the opening, a decrease in output of the heater may result in excessive water heating time. This would be considered inefficient for a unit's designated mission.

(4) An opening in the baffle greater than 1/2-inch in diameter is a sign that the metal has deteriorated beyond repair and the heater should be turned in to an authorized activity for disposal.

(5) Inspection can be made by inserting a light down the flue tube and checking the adjacent side for leaks or holes.

(6) Authorized maintenance expenditure limits for immersion heater are listed in TB 43-0002-23.

##### b. Cleaning.

(1) Refer to figure 4-7 and clean vaporizer plate and perforated sleeve with a stiff-bristle brush.

(2) Remove carbon, grit, or other foreign matter from holes in the burner.

c. *Replacement.* If the burner is unserviceable, lift it out of the burner compartment, and install a serviceable burner.

#### NOTE

Install the burner with the vaporizer plate facing up and perforated sleeve facing down.

#### 4-22. Air Conditioning-Heating Pipe

##### a. Removal.

(1) Refer to figure 4-6 and disjoint the four 2-foot sections of pipe (1) by removing the rivets and pulling the pipes apart at each joint.

(2) Remove the last section of pipe from the collar (22).

##### b. Cleaning and Inspection.

(1) Remove the soot from the pipe sections.

(2) Wash the exterior of the pipe sections with a brush and hot water.

(3) Dry the pipe sections thoroughly. Do not apply paint to the pipe sections.

(4) Inspect the pipe sections for holes, dents, and excessive rusting condition. Replace the pipe sections as required.

c. *Installation.* Install the pipe sections as described in paragraph 4-6.

#### 4-23. Vent Plug Gasket

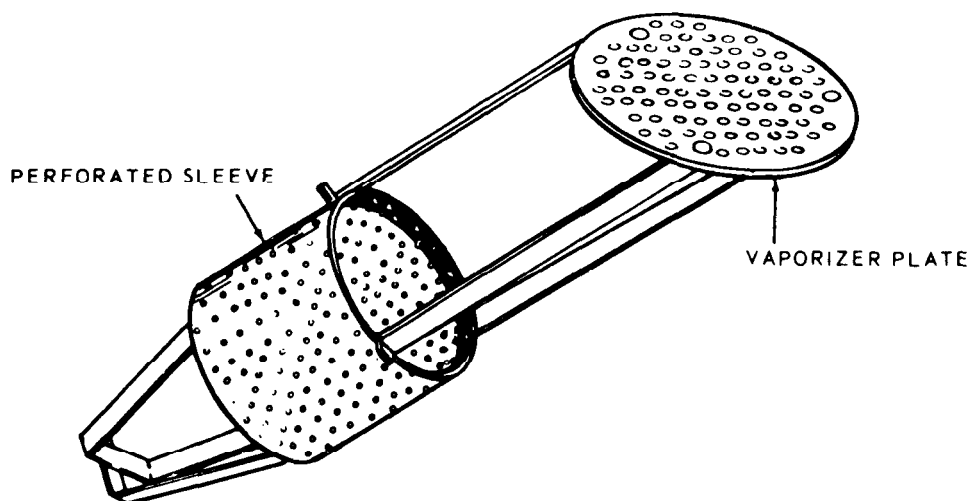
a. *Removal.* Refer to figure 4-6 and loosen the vent plug and gasket (3).

#### NOTE

Do not remove the vent plug from the tank.

Back off the vent plug 3-turns, approximately.

b. *Inspection;* Inspect the gasket for evidence of deterioration. Replace a missing or damaged gasket.



ME 4500-200-13/4-7 C3

Figure 4-7: Burner (4540-266-6835) (Model 447-2EX).

## Section X. TROUBLESHOOTING

### 4-24. General

Table 4-2 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the immersion heater. Malfunctions which may

occur are listed in table 4-2. Each malfunction stated is followed by a list of probable causes of trouble. The corrective action recommended is described opposite the probable cause.

Table 4-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Heater fails to start	a. Insufficient preheating of flue	Repeat preheating. Leave lighter in flue compartment until heater starts (para 4-11).
	b. Vent plug closed	Open vent plug (para 4-11)
	c. Fuel tank empty	Remove and fill tank (para 4-1)
	d. Water present in combustion chamber	Stop operation and clear water from combustion chamber (para 4-15).
2. Burner goes out	a. Fuel tank empty	Remove and fill tank (para 4-1)
	b. Vent plug closed or clogged	Open vent plug and be sure it is free of obstruction (para 4-11)
	c. Water present in combustion chamber	Stop operation and clear water from combustion chamber (para 4-15).
	d. Fuel rate too slow	Open fuel valve (para 4-11)
	e. Flame blown out	Close fuel valve slightly (para 4-13)
3. Heater smokes	a. Fuel rate too fast	Close fuel valve slightly (para 4-13)
	b. Stack is too short	Be sure to use at least four sections of pipe (para 4-6).

## Section XI. ORGANIZATIONAL MAINTENANCE PROCEDURES

### 4-25. Draft Gate

*a. Removal.* Refer to figure 4-6, and remove the draft gate supporting screw (20), the draft gate screw nut (21), and the draft gate (22) from the heater.

*b. Inspection.* Inspect the draft gate for a warped, distorted condition. Replace the draft gate as required.

*c. Installation.* Refer to figure 4-6, install the draft gate (22) on the heater body, and secure it with the draft gate supporting screw (20) and the draft gate screw nut (21).

### 4-26. Hood

*a. Removal.*

(1) Refer to figure 4-6, and remove the cotter pin

(2) Remove the hinge pin (11) and lift off the hood (12) from the burner collar (21).

*b. Inspection.* Inspect the hood for a distorted condition/broken hinge. Replace the draft gate as required.

*c. Installation.*

(1) Refer to figure 4-6, and place the hood (12) on the burner collar (23).

(2) Insert the hinge pin (11), and secure it with the cotter pin (13).

### 4-27. Fuel Tank Filler Plug

*a. Removal.* Refer to figure 4-6, and remove the filler plug (4) from the fuel tank (2).

*b. Inspection.* Inspect the plug for a damaged gasket or threads. Replace the plug as required.

*c. Installation.* Refer to figure 4-6, and install the filler plug (4) on the fuel tank (2).

### 4-28. Fuel Tank

*a. Removal.*

(1) Refer to figure 4-6, and remove the wingnut (5) that secures the hinged fuel tank strap.

(2) Open the strap and remove the fuel tank (2) from the fuel tank cradle (6).

*b. Cleaning.*

(1) Drain the tank.

(2) Clean the outside of the tank with a stiff brush and hot water.

(3) With the fuel valve removed, flush the fuel tank with a small amount of fuel to be sure all sediment and foreign matter are removed.

**NOTE**

Removing the fuel valve, and opening either the vent plug (3) or the filler plug (4), will eliminate possible vacuum and permit all liquid to be removed from the tank.

*c. Inspection.* Inspect the tank for leaks. Replace the tank as required.

*d. Installation.*

(1) Refer to figure 4-6, and install the fuel tank on the fuel tank cradle (6).

(2) Install the wingnut (5), securing the fuel tank strap.

**4-29. Fuel Tank Strap**

*a. Removal.*

(1) Remove the fuel tank from the heater (para 4-28).

(2) Refer to figure 4-6, file the end of the hinge pin, drive the pin out of the hinge.

(3) Remove the strap from the cradle.

*b. Inspection.* Inspect the strap for a broken or distorted condition. Replace the strap as required.

*c. Installation.*

(1) Refer to figure 4-6 and install the strap on the cradle.

(2) Insert a new pin through the hinge and peen the end of the pin.

(3) Install the fuel tank on the heater (para 4-28).

**4-30. Fuel Tank Strap Cradle**

*a. Removal.*

(1) Refer to figure 4-6 and remove two wingnuts (7) that secure cradle to heater.

(2) Remove cradle with strap and tank attached.

(3) Remove wingnut (5) and open strap and lift off fuel tank (2).

(4) Remove fuel tank strap from cradle (para 4-29).

*b. Inspection.* Inspect cradle for distorted condition and for missing fasteners. Replace cradle as required.

*c. Installation.*

(1) Install the fuel tank strap on the cradle (para 4-29).

(2) Install fuel tank and secure strap (para 4-28).

(3) Refer to figure 4-6 and install cradle (with fuel tank attached) on the heater.

(4) Install two wingnuts (7) securing cradle to heater.

**4-31. Fuel Valve Assembly**

*a. Removal.* Refer to figure 4-6 and unscrew fuel valve (10) with elbow (9) and nipple (8) from fuel tank (2).

*b. Cleaning.* Scrape or scrub off any corrosion from valve. Clean out any obstructions from inside valve passages.

*c. Inspection.* Inspect fuel valve for evidence of excessive wear and leaking condition.

*d. Installation.* Refer to figure 4-6 and screw nipple (8) into fuel tank (2) with elbow (9) and fuel valve (10) attached.

**4-32. Lighter Cup Assembly**

*a. Removal.*

(1) Refer to figure 4-6 and remove the cotter pin (25) that secures the lighter cup assembly (27) and return spring (26) to the pivot bracket.

(2) Remove wick retainer (28) and wick (29) from the lighter cup assembly.

*b. Inspection.*

(1) Inspect lighter cup wick for evidence of deterioration. Replace wick as required.

(2) Inspect lighter cup assembly for broken or distorted condition. Replace as required.

*c. Installation.*

(1) Refer to figure 4-6 and install wick (29) in lighter cup (27) and secure with wick retainer (28).

(2) Position lighter cup lever (27) through opening in combustion chamber and align with pivot bracket. Insert return spring (26) and secure lighter cup lever with cotter pin (25).

**Section XII. SHIPMENT AND LIMITED STORAGE****4-33. Preparation of Equipment for Shipment Within Zone of Interior**

*a. General.* Detailed instructions for the preparation for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

*b. Inspection.* Examine the heater for any unusual conditions such as damage or missing components.

Inspect the immersion heater in accordance with steps outlined in preventive maintenance services (para 4-18). Deficiencies and shortcomings along with corrective action taken, will be recorded on DA Form 2404 (Refer to TM 38-750).

*c. Cleaning and Drying.* Cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning and drying, types of preserva-

tives, and methods of application are described in TM 38-230-2.

d. Painting. Paint surfaces where the paint has been removed or damaged. Paint is required as follows:

(1). Heater body, fuel tank. assembly, collar assembly, and draft gate. The upper six inches of the outside surface of the body assembly and hanger as well as all of the hangers which will be outside of the corrugated can shall be thoroughly cleaned, given a coat of primer and, when dry, given a coat of enamel. The outside surface of the fuel tank assembly with the fuller plug and vent plug in place and closed; with the 1/8 inch outlet opening closed; and both inside and outside of the hood, excluding the instruction plate, shall be thoroughly cleaned, given a coat of primer and, when dry, given a coat of enamel. All inside and outside surfaces of the collar assembly; all surfaces of the draft gage; all surfaces of the fuel tank strap and assembly except threads, both male and female; the entire gasoline valve with elbow and nipple except for threads and valve stem; the hanger screws except the threaded portion; the hinge pin; and various nuts and heads of screws shall be thoroughly cleaned, given a coat of primer and, when dry, given a coat of enamel.

(2) The primer shall conform to Federal specification TT-P-636 and the enamel to Federal specification TT-P-636. The color of the enamel shall approximate color number X24087, olive drab of Federal standard 595,

#### NOTE

Painting of materiel should be accomplished in the open during dry weather when the temperature is not below 50°F. Adequate forced draft ventilation for indoor work should be provided to carry off fumes.

e. *Depreservation Guide.* Record depreservation instructions on DA Form 2258 or DD Form 1397 as applicable.

f. *Sealing of Openings.* Openings that will permit the direct entry of water into the interior of fuel lines, oil burner, fittings, burner chamber, and fuel tank, shall be sealed with pressure-sensitive tape conforming to specification PPP-T-60, class 1, or covered with

waterproof kraft wrapping paper (UU-P-271) secured in place with tape.

g. Fuel Tank (Boxed or Crated Items). Drain the fuel tank after heater preservation.

h. *Exterior Surfaces.*

(1) Apply a thin coat of CFM (corrosion preventive compound, Federal stock number 8030-251-5048) to all surfaces of the burner, fuel valve, heater body, and fuel tank.

(2) Coat the threads of screws, bolts, and nuts with a thin film of PL-medium (lubrication oil, general purpose preservative). This lubricant is to be used for shipment and storage purposes only and must be removed before putting the heater into operation.

i. *Disassembly, Disassembled, and Basic Issue Items.* Disassembly shall be limited to the removal of components and parts that are subject to pilferage or damage. Removed parts and basic issue items shall be packed in a suitable containers and secured to the heater to prevent loss or damage. Refer to TM-38-230-2 for guidance in container construction.

j. *Marking.* Mark in accordance with MIL-STD-129.

### 4-34. Limited Storage

a. *General.* This paragraph provides instructions for preparation of the immersion heater for limited storage, not to exceed six months.

b. *Inspection and Maintenance of Equipment on Storage.* When heaters have been placed in limited storage, all scheduled preventive maintenance services, including inspection, shall be suspended and preventive maintenance inspection shall be performed as specified herein. Perform quarterly preventive maintenance services when the heater is initially placed in limited storage and every 90 days thereafter. Record all deficiencies and shortcomings, together with corrective action taken, on DA Form 2404. Required maintenance will be performed promptly to insure that the heater is mechanically sound and ready for immediate use. After each inspection represerve the heater as outlined in paragraph 4-33.

## Section XIII. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

### 4-35. General

When capture or abandonment of the heater to an enemy is imminent the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. Based on this

decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all heaters and all corresponding repair parts.

#### 4-36. Demolition to Render the Heater Inoperative

*a. Demolition by Mechanical Means.* Use sledge hammers, crowbars, picks, axes, or any other heavy tool which may be available to destroy the following:

- (1) Air conditioning-heating pipes
- (2) Fuel tank
- (3) Heater body
- (4) Fuel valve

*b. Other Demolition Methods.*

(1) Scattering and concealment. Remove all easily accessible components and scatter them through dense foliage, bury them in dirt, or submerge them in a lake, stream, or other body of water.

(2) *Submersion.* Totally submerge the heater in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

*c. Training.* All operators should receive thorough training in the destruction of the heater. Refer to FM 5-25. Simulated destruction, using methods given above, should be included in the operator training program. It must be emphasized in training that demolition operations usually are necessitated by critical situations when time available for carrying out destruction is limited. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction without reference to this or any other manual.

### Section XIV. DIRECT SUPPORT MAINTENANCE INSTRUCTION

#### 4-37. Heater Body

Heater body repair is limited to welding open seams

on the combustion chamber and broken welds and holes in the stack partition.

### Section XV. REPAIR PARTS

#### 4-38. General

The following tubular listings comprise the repair parts for the immersion heaters. Those parts coded A are applicable to immersion heater model 447-2EX

only. All other parts are common to both models. For explanation of listings, refer to paragraphs 1-3 through 1-8 in this manual.



(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION  REF NUMBER & MFR CODE	(4) USABLE ON CODE	(5) UNIT OF MEAS	(6) QTY INC IN UNIT	(7) 1 5-DAY ORGANIZATIONAL MAINTENANCE ALW				(8) ILLUS- TRATION	
						(a)	(b)	(c)	(d)	(a)	(b)
						1-5	6-20	21-50	51-100	FIG. NO.	ITEM NO.
00001		PART I- REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE GROUP 01 - IMMERSION HEATER FOR CORRUGATED CANS									
X		BODY, HEATER		EA	1					4-6	24
00002		BODY, HEATER	A	EA	1					4-6	30
X											
00003	5306-829-2221	BOLT, HOOK: 7/16-14, 3 5/8 IN. (31577) 56955-1		EA	1					4-6	15
00004	5306-829-2220	BOLT, HOOK: 7/16-14, 2 5/8 IN. (31577) 56956-1		EA	1					4-6	16
00005	4540-542-2930	BURNER: (31577) 57015-91		EA	1	•	2	3	7	4-6	14
P O	4540-740-0125	COLLAR ASSEMBLY: (93084) M5000		EA	1	•	•	•	•	4-6	23
00006	4540-691-1774	CRADLE ASSEMBLY: (31577) 57002-1		EA	1	•	•	•	•	4-6	31
00007	4730-249-1474	ELBOW, PIPE: 1/8 IN. x 90 DEG		EA	1					4-6	9
00008	4540-125-3769	GASKET, VENT PLUG: (48745) K12793		EA	1	•	•	2	2	4-6	3
P O	4540-555-8530	GATE, DRAFT: (31577) 57125-91	B	EA	1	•	•	•	•	4-6	22
00010	4540-555-0771	HOOD, BURNER: (31577) 57013-91		EA	1	•	•	•	•	4-6	12
00011	5340-124-9205	PIN, HINGE: RH, 1/4 x 1 1/2 IN. (48745) VK12850		EA	1	•	•	•	•	4-6	11
P O	4540-129-3241	LIGHTER ASSEMBLY: (48745) Y11683	A	EA	1	•	•	2	2	4-6	27
00012A	4540-555-0942	LIGHTER, TORCH: (81349) MILH1597	B	EA	1	2	3	6	13	4-6	19
00013	4730-196-1482	NIPPLE, PIPE: 1/8 x 2 3/8 IN.		EA	1					4-6	8
P O	5310-010-5604	NUT, PLAIN, SQUARE: 1/4 IN., 20		EA	4					4-6	21
00014	5310-00-828-8189	NUT, PLAIN, WING: 5/16 IN., 18 (96906) MS35425-41		EA	1					4-6	5
O	5310-012-6177	NUT, PLAIN, WING: 1/4 IN., 20		EA	3					4-6	7
00015	5315-839-2326	PIN, COTTER: 3/32 IN. x 1/2 IN.		EA	1					4-6	13
00016	5315-010-3409	PIN, COTTER: 3/16 IN. X 1 1/2 IN.	A	EA	1					4-6	25
O	5315-187-9569	PIN, COTTER: 3/16 IN. X 3 1/2 IN.		EA	1					4-6	17
00017	4520-277-8339	PIPE, AIR CONDITIONING: (31577) 57026-1		EA	4	2	4	8	17	4-6	1
00018	4540-021-2063	PLATE, BACKING HANGER: (81337) 5-13-451		EA	1	•	•	•	•	4-6	18
00019	4540-555-8527	PLUG, FILLER: (31577) 56950-91		EA	1	•	•	•	2	4-6	4
P O	5365-182-5509	RETAINER, WICK: (48745) K12811	A	EA	1	2	2	4	8	4-6	28
00020	5305-988-1723	SCREW, MACHINE: 1/4 IN., 20 x 1/2 IN.		EA	4					4-6	20
00021	4540-124-7132	SPRING, LIGHTER: (48745) K12810	A	EA	1	2	2	4	50	4-6	26
P O	4540-555-8528	STRAP, FUEL TANK: (93084) M3000		EA	1	•	•	4	5	4-6	6
00022	4540-555-8529	TANK: (31577) 56974-1		EA	1	•	•	2	10	4-6	2
00023	9390-125-3784	WICK: 4 1/4 IN. (48745) Z3188	A	EA	1	4	8	17	200	4-6	29
P O	4540-555-8231	VALVE, FUEL: (81337) 5-13-5		EA	1	•	•	•	30	4-6	10
00024											
00025											
00026											
00027											
00028											
00029											
00030											
00031											

(1) SMR code	(2) Federal stock number	(3) Description  Ref number & mfr code	(4) Unit of meas	(5) Qty inc in unit	(6) 15-Day Organizational Maintenance allow				(7) Illustration	
					(a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(a) Fig. No.	(b) Item No.
P O 00027	4540-124-7132	SPRING, LIGHTER: (48745) K12810.	A ea	1	*	*	2	2	4-6	26
P O 00028	4540-555-8528	STRAP, FUEL TANK: (93084) M3000.	ea	1	*	*	*	*	4-6	6
P O 00029	4540-555-8529	TANK: (31577) 56974-1.	ea	1	*	*	*	*	4-6	2
P O 00030	9390-125-3784	WICK: 4 1/4 in. (48745) Z3188.	A ea	1	2	2	4	8	4-6	29
P O 00031	4540-555-8531	VALVE, FUEL: (81337) 5-13-5.	ea	1	*	*	*	*	4-6	10

(1)  SMR CODE	(2)  FEDERAL STOCK NUMBER	(3)  DESCRIPTION   REF NUMBER & MFR CODE	(4)  UNIT OF MEAS	(5)  QTY INC IN UNIT	(6) 30-DAY DS MAINTENANCE ALW			(7) 1-Yr ALW per 100 equip cntgy	(8) ILLUS- TRATION	
					(a)	(b)	(c)		(a)	(b)
					1-20	21-50	51-100		FIG. NO.	ITEM NO.
00001		PART II—REPAIR PARTS FOR DS MAINTENANCE GROUP 01 - IMMERSION HEATER FOR CORRUGATED CANS								
X		BODY, HEATER	EA	1					4-6	24
00002										
X		BODY, HEATER	A EA	1		•			4-6	30
00003										
	5306-829-2221	BOLT, HOOK: 7/16-14, 3 3/8 in. (31577) 56955-1	EA	1					4-6	15
O	5306-829-2220	BOLT, HOOK 7/16-14, 2 5/8 in. (31577) 56956-1	EA	1					4-6	16
00005		BURNER:	EA	1	3	7	13	160	4-6	14
PO	4540-542-2930	(31577) 57015-91	EA	1	•	•	•	5	4-6	23
00006	4540-740-0125	COLLAR ASSEMBLY: (93084) M5000	EA	1	•	•	•	5	4-6	31
00007	4540-691-1774	CRADLE ASSEMBLY: (31577) 57002-1	EA	1	•	•	•	5	4-6	9
PO	4730-249-1474	ELBOW PIPE 1/8 in. x 90 deg	EA	1					4-6	3
00010	4540-125-3789	GASKET VENT PLUG: (48745) K12793	EA	1	2	2	2	40	4-6	22
PO	4540-555-8530	GATE, DRAFT: (31577) 57125-91	B EA	1	•	•	2	8	4-6	12
00011	4540-555-0771	HOOD BURNER: (31577) 57013-91	EA	1	•	•	•	5	4-6	11
00012	5340-124-9205	PIN, HINGE: RH, 1/4 x 1 1/2 in. (48745) VK12850	EA	1	•	•	•	50	4-6	27
00012A	4540-129-3241	LIGHTER ASSEMBLY: (48745) Y11683	A EA	1	2	2	3	30	4-6	19
00013	4540-555-0942	LIGHTER, TORCH: (81349) MILH1597	B EA	1	6	13	25	300	4-6	8
00014	4730-196-1482	NIPPLE, PIPE 1/8 x 2 3/8 in.	EA	1					4-6	21
00015	5310-010-5604	NUT, PLAIN, SQUARE 1/4 in., 20	EA	4					4-6	5
O	5310-00-828-8189	NUT, PLAIN, WING: 5/16 in., 18 (96906) MS35425-41	EA	1					4-6	7
00016	5310-012-6177	NUT, PLAIN, WING 1/4 in., 20	EA	3					4-6	13
00017	5315-839-2326	PIN, COTTER 3/32 in. X 1 1/2 in.	EA	1					4-6	25
00018	5315-010-3409	PIN, COTTER 3/16 in. X 1 1/2 in.	A EA	1					4-6	17
00019	5315-00-187-9569	PIN, COTTER 3/16 in. X 3 1/2 in. (96906) MS24665-503	EA	1					4-6	18
00020	4540-021-2063	PLATE, BACKING HANGER: (81337) 5-13-451	EA	1	•	•	2	10	4-6	4
PO	4540-555-8527	PLUG, FILLER (31577) 56950-91	EA	1	•	2	2	20	4-6	28
00023	5365-182-5509	RETAINER, WICK (48745) K12811	EA	1	4	8	17	200	4-6	20
00024	5305-988-1723	SCREW, MACHINE 1/4 in., 20 x 1/2 in.	EA	4					4-6	26
00025										
O	4540-124-7132	SPRING, LIGHTER: (48745) K12810	A EA	1	2	2	4	50	4-6	6
PO	4540-555-8528	STRAP, FUEL TANK: (93084) M3000	EA	1	•	•	4	5	4-6	2
00026	4540-555-8529	TANK: (31577) 56974-1	EA	1	•	•	2	10	4-6	29
00027	9390-125-3784	WICK: 4 1/4 IN. (48745) Z3188	A EA	1	4	8	17	200	4-6	10
00028	4540-555-8231	VALVE, FUEL: (81337) 5-13-5	EA	1	•	•	•	30	4-6	
00029										
PO										
00030										
00031										



**INDEX-Federal Stock Number and Reference Number  
Cross-Reference to Index Number**

<i>Stock Number</i>	<i>Index No.</i>	<i>Stock Number</i>	<i>Index No.</i>	<i>Stock Number</i>	<i>Index No.</i>
4520-277-8339	00022	4540-555-8528	00028	5306-829-2220	00005
4540-021-2063	00023	4540-555-8529	00029	5306-829-2221	00004
4540-124-7132	00027	4540-555-8530	00011	5310-010-5604	00016
9390-125-3769	00010	4540-555-8531	00031	5310-012-6177	00018
4540-125-3784	00030	4540-691-1774	00008	5310-00-828-8189	00017
4540-129-3241	00013	4540-740-0125	00007	5315-010-3409	00020
4540-542-2930	00006	4730-196-1482	00015	5315-839-2326	00019
4540-555-0771	00012	4730-249-1474	00009	5340-124-9205	00012A
4540-555-0942	00014	5305-012-0628	00026	5365-182-5509	00025
4540-555-8527	00024	5306-248-8687	00021		

<i>Reference No.</i>	<i>Mfr. Code</i>	<i>Index No.</i>	<i>Reference No.</i>	<i>Mfr. Code</i>	<i>Index No.</i>
			Z3188	48745	00030
K12793	48745	00010	56950-91	31577	00024
K12810	48745	00027	56955-1	31577	00004
MILH1597	81349	00014	56956-1	31577	00005
MS35425-41	96906	00017	56974-1	31577	00029
M3000	93084	00028	57002-1	31577	00008
M5000	93084	0007	57013-91	31577	00012
VK12850	48745	00012A	57015-91	31577	00006
Y11683	48745	00013	57026-1	31577	00022
K12811	48745	00025	57125-91	31577	00011
5-13-451	81337	00023			
5-13-5	81337	00031			

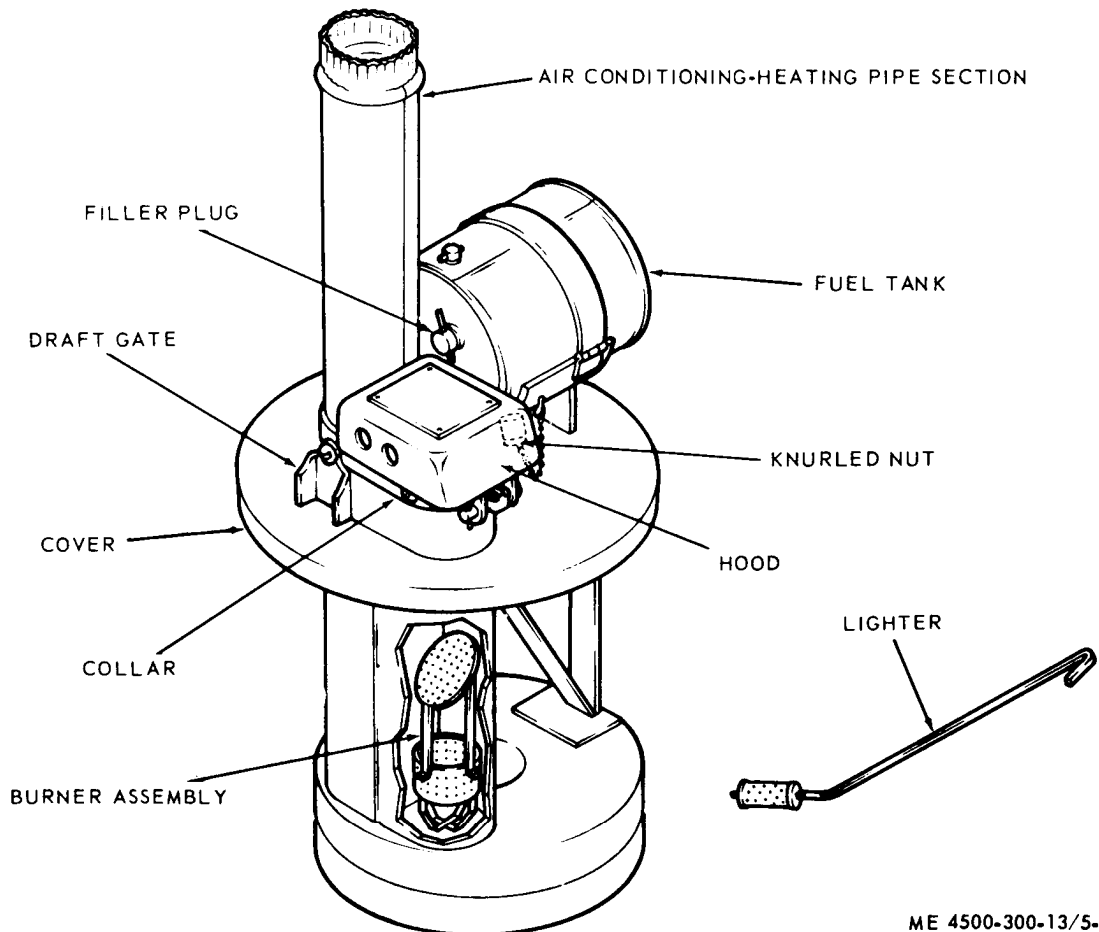
**CHAPTER 5**  
**HEATER, IMMERSION, LIQUID FUEL, FIRED FOR TANK TRAILER**  
**FSN 4540-266-6834**

**Section I. DESCRIPTION AND TABULATED DATA**

**5-1. Description**

*a. General.* The current production model heater (FSN 4540-266-6834) for tank trailer (fig. 5-1) is of water tight, sheet-steel construction and consists of a doughnut-shaped combustion chamber and a stack assembly welded together. A vertical partition divides the stack into two compartments; the burner compartment which houses the burner, and the flue compartment through which combustion gases leave the heater. The partition between the two stack compartments extends to the bottom of the heater and causes air entering the chamber from the burner compartment to circulate completely around the chamber before leaving by way of the flue compartment. The swing-type draft gate is located on the side of the flue compartment, near the top. A steel disc 17-5/16 inches in diameter, provides a cover for

the tank as well as a support for the heater assembly. The flue and burner stack extends through the disc and is welded in place at a point just below the draft gate. An instruction plate is located on the hinged hood (fig. 5-1) which covers the top of the burner compartment. The vaporizer plate of the downdraft burner consists of a 3/32 inch layer of absorbent asbestos, sandwiched between two perforated ovals of corrosion-resistant steel. The fuel tank is held in place by a cradle and strap assembly. The fuel tank is equipped with a valve assembly, a vent plug, and a filler plug, all located on the same end of the cylindrical tank. The heater is equipped with an 8-foot air-conditioning-heating pipe that consists of four sections of pipe (fig. 5-1). The perforated cylinder on the end of the lighter is filled with absorbent asbestos.



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Figure 5-1. Immersion heater (tank).

b. The immersion heater utilizes leaded or white gas as its normal fuel.

### 5-2. Tabulated Data

Capacities:		
Fuel tank . . . . .	2.2 gallons	
Heat output. . . . .	35,000 British Thermal	Units
Cubage, crated . . . . .		
.5.6 cubic feet		
Diameter:		
Combustion chamber . . . . .	13 1/2 inches	
Cover . . . . .	17-5/16 inches	
Stovepipe . . . . .	4 inches	
L e n g t h :		
Burner. . . . .	12-3/8 inches	
Heateronly . . . . .	33-1/4 inches	
Heater with fuel tank . . . . .	37inches	
Heater with pipesections . . . . .	10feet	
Weight:		
Complete . . . . .	63 ½ pounds	
Crated . . . . .	100 pounds	

### 5-3. Difference in Models

The modified standard model tank heater is similar in shape and size to the current production model. In installing the pivot-type draft gate on standard models, a hole 1 1/4 inches in diameter has been cut

through the flue compartment. A spacer plate has been tack welded to the outside surface of the stack, around the hole. Aswingdraft gate with supporting stud andnut has been installed over the hole. In the modification of standard models, the vertical, rec-tangular piece of sheet metal which serves asadraft gate has had a 1/4 inch, 20-NCT hole drilled through it, 5-1/16 inches from the bottom and in the horizon-tal center of the gate. The drilled gate has been in-stalled in a closed position within the stack assembly and secured with a 1/4 inch, 20-NC round head screw and nut. Since the partition between the flue com-partments in standard models does not extend all the way to the bottom, the nut will be in contact with the bottom of the partition. The draft gate is perman-ently fixed and extends to the bottom of the heater, and if the heater is inverted, the gate will not slip in its slot. The cast iron hoods, and hoods having obsolete instruction plates, have been replaced with new hoods with hinge pins and retaining cotter pins. The burner of the modified standard tank trailer heater is identi-cal to the burner of the current production model tank trailer heater.

## Section II. INSTALLATION AND OPERATING INSTRUCTION

### 5-4. Service Upon Receipt of Materiel

- a. *Inspecting and Servicing the Equipment.*
  - (1) *Inspection.*
    - (a) Inspect the entire heater assembly for signs of physical damage.
    - (b) Inspect heater to be sure that it is properly assembled, secure, clean, correctly adjusted and for evidence of fuel leaks.
    - (c) Correct deficiencies within the scope of organizational maintenance before placing the heater in service.
  - (2) *Servicing.*
    - (a) Perform the daily preventive maintenance services (para 5-18).
    - (b) Perform the quarterly preventive main-tenance services (para 5-18).

### 5-5. Installation of Separately Packaged Components

No separately packaged items are shipped with the heater.

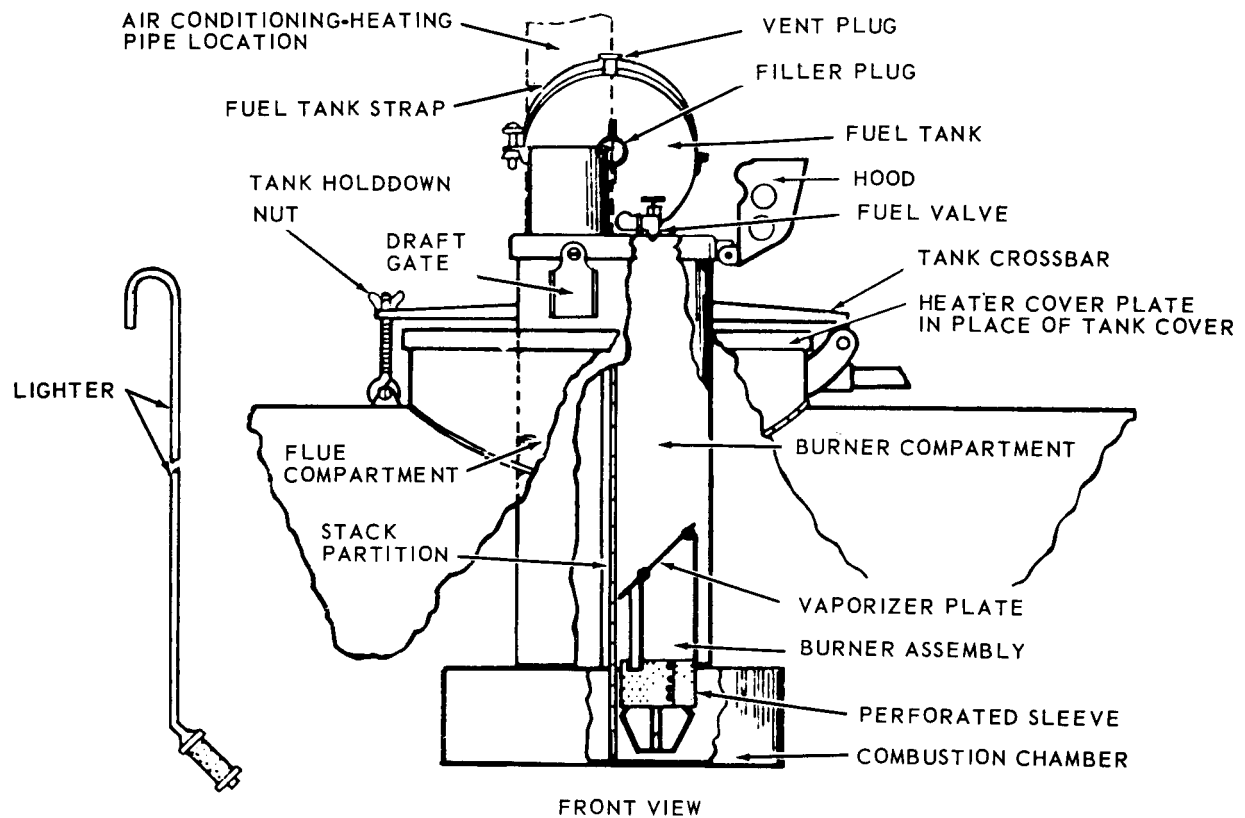
### 5-6. Installation or Setting Up Instructions

- a. *Location.* Select a site that is level and as shel-tered as possible.
- b. *Setting Up.*

- (1) Refer to figure 5-2 and assemble the immer-sion heater.
  - Note.* Use "V" jaw wrench FSN 5120-595-9193 to tighten pipe fittings.
- (2) Refer to figure 5-2 and install burner in burn-er compartment with vaporizer plate end facing up.
- (3) Remove trailer tank cover, leaving hinged crossbar in place.
- (4) Check heater to be sure there is no fuel in the combustion chamber. Raise crossbar and install heater in tank opening.
- (5) Refer to figure 5-2 and lower crossbar into clevis on top of heater cover plate and engage wingnut and bolt assembly on tank with the slotted end of crossbar. Tighten wingnut to keep heater from float-ing. Water level in tank should be 6 inches below collar of heater assembly.

**Caution: Do not attempt to install heater with a fill tank of fuel because the balance will be destroyed and will cause the heater to fall.**

- (6) Refer to figure 5-2 and install fuel tank in cradle strap assembly and secure it with wingnuts (or chained knurled nuts provided).
- (7) Refer to figure 5-2 and attach four 2-foot sections of air-conditioning-heating pipe to the heater.



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Figure 5-2. Immersion heater-installation (sheet 1 of 3).



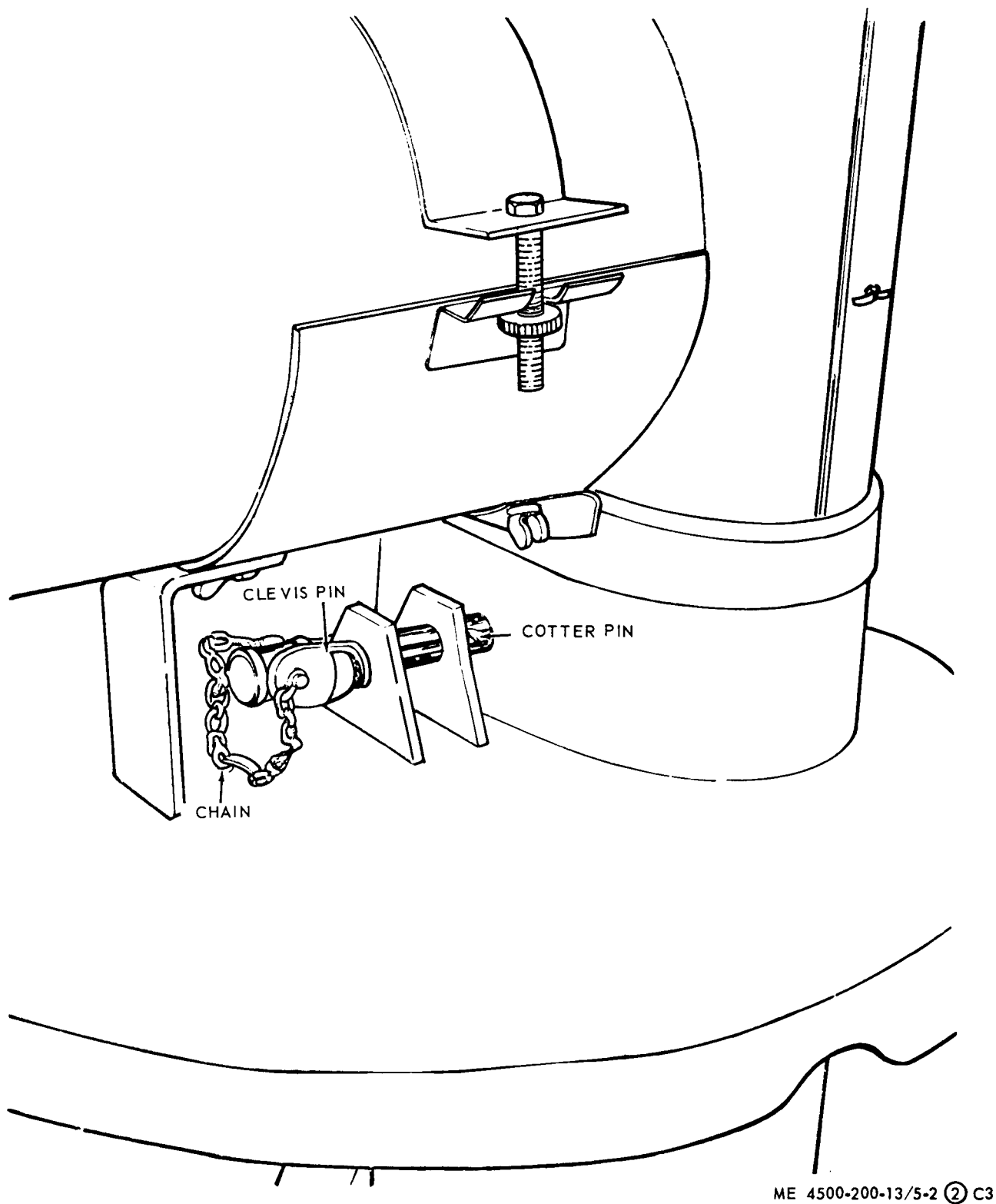
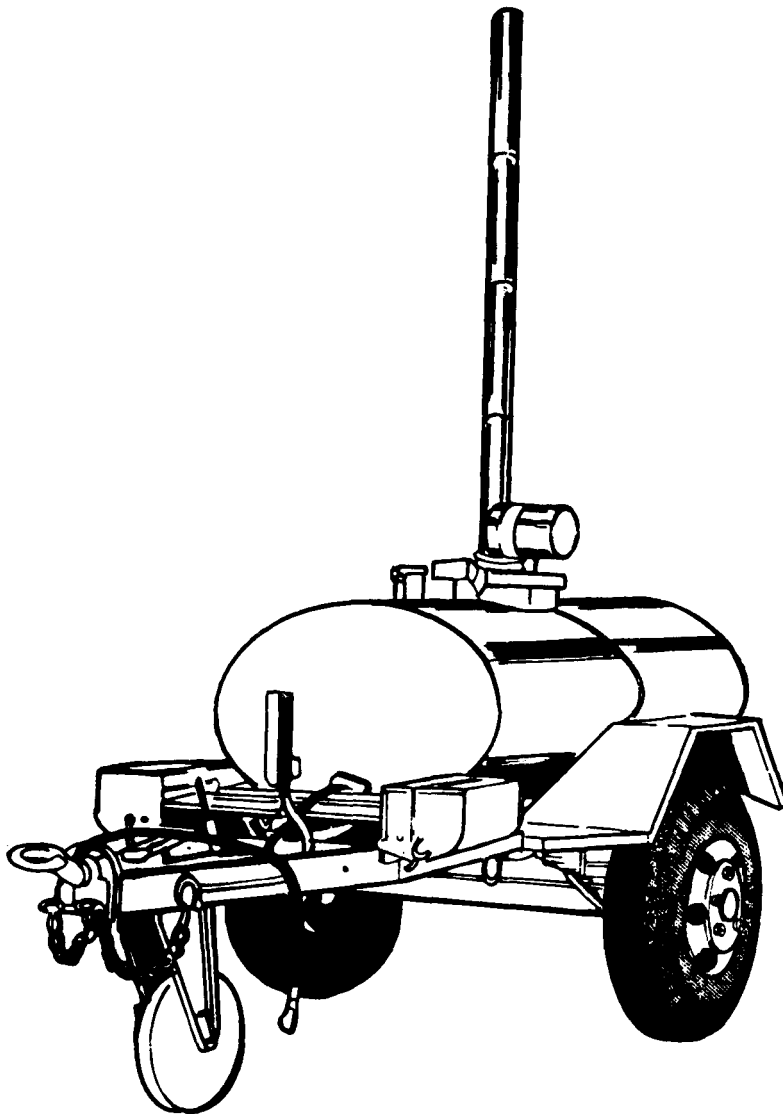
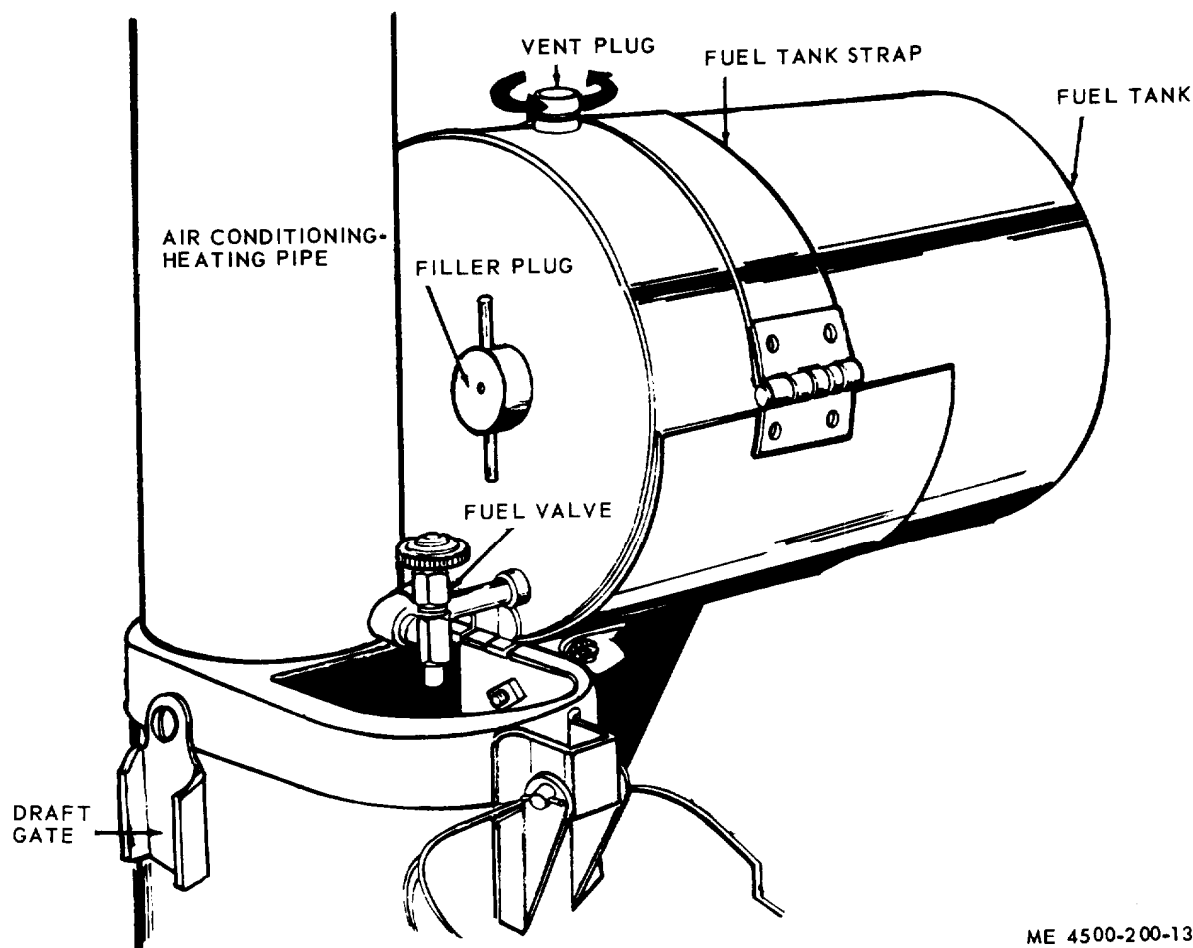


Figure 5-2. Immersion heater-installation (attaching clevis) (sheet 2 of 3).



*Figure 5-2. Immersion heater-installation (heater installed in tank) (sheet 3 of 3).*



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Figure 5-3. Immersion heater controls.

### Section III. MOVEMENT TO A NEW WORK SITE

#### 5-7. Dismantling for Movement

##### a. Dismantling.

- (1) Remove stack and separate into sections.
- (2) Remove fuel tank from heater.
- (3) Remove heater from tank.
- (4) Clean soot from pipe sections and burner

assembly.

(5) If unit is being moved to another space in the same area, it can be hand carried.

b. *Reinstalled After Movement.* Reinstall the immersion heater at the new work site as directed in paragraph 5-6.

### Section IV. CONTROLS

#### 5-8. General

This section describes the various controls and provides the operator/crew sufficient information to insure proper operation of the immersion heater. Controls are identical for all models.

#### 5-9. Controls

Refer to figure 5-3 for the location of each control.

a. *Draft Gate.* The swing type draft gate is located on the side of the flue compartment near the top.

Move the gate to one side when pre-heating the flue and close it after about 2 minutes.

b. *Fuel Valve.* The fuel valve is located on a short pipe nipple extending from the fuel tank. Adjust the valve as described in paragraph 5-11.

c. *Vent Plug.* The vent plug is located on top of the fuel tank. When preheating the flue, unscrew the vent plug as far as possible without forcing it and leave it unscrewed as long as the heater is in operation.

**Section V. OPERATION UNDER USUAL CONDITIONS****5-10. General**

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the immersion heater.

b. The operator must know how to perform every operation of which the immersion heater is capable. Paragraphs 5-11 and 5-12 give instructions on starting and stopping the immersion heater and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary a given procedure to fit the individual job.

**5-11. Starting**

a. *Preparation for Starting.* Perform the before-

operation services, paragraph 5-4.

b. Preheat Flue. Refer to figure 5-4.

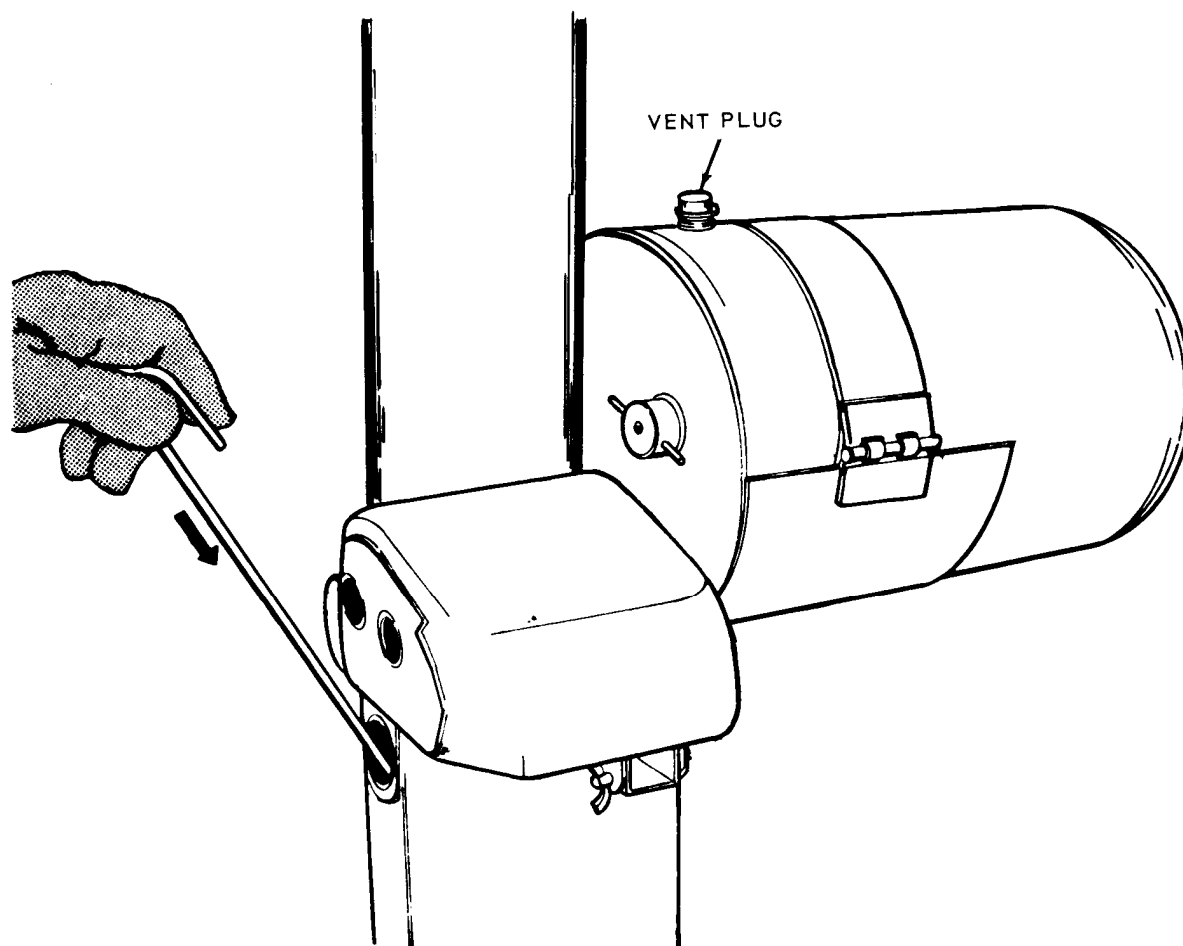
(1) Open the vent as far as possible.

(2) Soak the lighter in a mixture of half gasoline and half engine oil. Do not saturate the lighter by holding it under the fuel drip valve.

(3) Use a match to ignite the lighter.

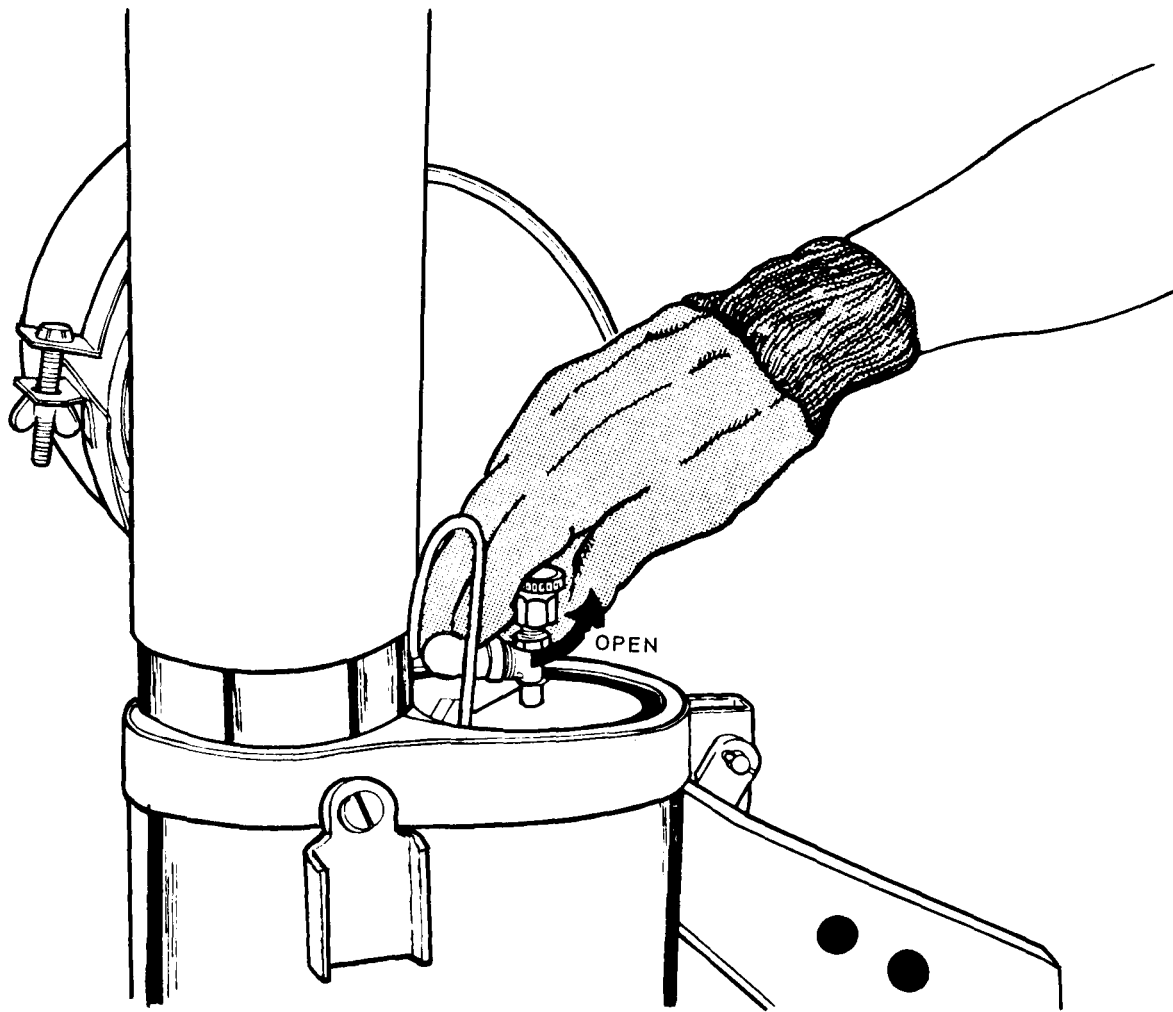
(4) Swing the draft gate to one side and insert the burning lighter into the flue compartment. The heat from the lighter causes a draft down the burner compartment, around the combustion chamber, and up and out the flue compartment.

(5) Remove the lighter in about 2 minutes and close the draft gate.



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Figure 5-4. Preheating flue.



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Figure 5-5. Lighting burner and adjusting fuel valve.

*c. Starting.*

(1) Immediately after preheating the flue, place the burner lighter on top of the vaporizer plate.

(2) Wearing a glove on the hand, open the fuel valve slightly, and allow the fuel to drip on the vaporizer plate (fig. 5-5).

(3) Adjust the fuel valve until the fuel flows in rapid drops but not in a fine stream.

(4) Leave the lighter in the burner compartment until its flame burns out, and then remove the lighter.

(5) Make a final adjustment of the fuel valve to obtain the flame desired.

(6) Close the hood and leave it closed during operation.

(7) Check for and wipe up any spilled fuel.

**5-12. Stopping**

*a.* Refer to figure 5-5, and close the fuel valve and vent valve.

*b.* Remove the stack and fuel tank from the heater assembly. Remove the heater from the tank, and turn it upside down so that any accumulated fuel in the combustion chamber can drain out.

*c.* Perform after-operation services. (para 5-18).

## Section VI. OPERATION UNDER UNUSUAL CONDITIONS

### 5-13. Extreme Cold

*a.* During extremely cold weather, operate heater in a shelter if possible. Be sure to pipe exhaust fumes outside.

*b.* If heater must be operated outside, provide a windbreak such as a tent, building, truck, or tarpaulins.

*c.* Leave burning lighter in the flue compartment for 4 or 5 minutes instead of the usual 2 minutes when preheating the flue.

*d.* In very severe weather, use two lighters simultaneously; insert one lighter in the flue compartment and the other in the burner compartment.

### 5-14. Extreme Heat

*a.* Exercise great care in lighting and operating

heaters in extreme heat because of rapid evaporation of the fuel under these conditions.

*b.* Under tropical conditions, remove condensation from heaters with dry cloths to keep the equipment as free as possible of moisture.

### 5-15. Heavy Rain

*a.* Up-end the heater before each operation to drain any water from combustion chamber.

*b.* Protect the heater with an overhead shelter whenever possible.

*c.* Do not expose burner to moisture. The asbestos layer in the burner will absorb water and this will interfere with operation of the heater.

## Section VII. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE

### 5-16. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for maintenance of the immersion heater.

### 5-17. Organizational Repair Parts

Organizational maintenance repair parts are listed in section XV of this chapter.

## Section VIII. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

### 5-18. General

To insure that the immersion heater is ready for operation, systematically check the space heater so that defects may be discovered and corrected before

they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in table 5-1.

## Section IX. OPERATOR'S MAINTENANCE

### 5-19. General

This section contains information for the operator's maintenance of the immersion heater. The maintenance includes a visual check of the assembly.

### 5-20. Heater Body

*a.* Inspect.

(1) Refer to figure 5-6 and inspect heater body

for dents or broken welds. Broken welds should be reported to direct support maintenance.

(2) Inspect stock partition for holes or broken welds. Broken welds and holes in stock partition should be reported to direct support maintenance.

Item Number	Interval				Org.	M	Q	B - Before operation D - During operation			A - After operation W - Weekly			M - MonthL! Q-Quarterly		
	Operator							Item to be inspected	Procedure	Reference						
	Daily															
	B	D	A	W												
1	X		X					Fuel tank	Be sure fuel tank is filled with correct fuel.					para 5-1		
2	X	X						Heater aaay	Inspect for proper installation.					para 5-4		
3	X	X						Installation	Be sure fumes are piped outaide if heater is to be operated within a building or tent.					para 5-13		
4	X							Combustion chamber	Inspect for broken welds and holes.					para-5-36		
									Check combustion chamber to be sure there is no unburned fuel in it.					para 5-6, 5-12		
5	X							Fuel	Inspect for leaks or spilled fuel.					para 5-4		
6	X							Water level	Check water level.					psra 5-6		
7	X	X						Vent plug	Inspect control.					para 5-9		
8		X						Fuel valve	Adjust fuel flow.					para 5-11		
9			X	X	X			Heater body	Inspect for clean condition.					para 5-20		
10				X	X			Burner	Inspect and service.					para 5-21		

*b. Cleaning.*

(1) Refer to figure 5-6 and clean dust and grease off heater body (20).

(2) Use fine sandpaper to rub off rust spots.

#### 5-21. Burner

*a. Inspection.*

(1) Refer to figure 5-7 and inspect the burner for excessive corrosion.

(2) Inspect for damage such as distortion, cracks, and breaks. Inspect asbestos filler for deterioration.

*b. Cleaning.*

(1) Refer to figure 5-7 and clean vaporiser plate and perforated sleeve with stiff bristle brush.

(2) Remove carbon, grit, or other foreign matter from holes in the burner.

*c. Replacement.* If burner is unserviceable, lift it out of burner compartment and install a serviceable burner.

*Note.* Install burner with the vaporiser plate facing up and perforated sleeve facing down.

#### 5-22. Air-Conditioning-Heating Pipe

*a. Removal.*

(1) Refer to figure 5-6 and disjoint the four 2-foot sections of pipe (1) by removing rivets and pulling pipes apart at each joint.

(2) Remove last section of pipe from collar (19).

*b. Cleaning and Inspection.*

(1) Remove soot from pipe sections.

(2) Wash exterior of pipe sections with brush and hot water.

(3) Dry pipe sections thoroughly. Do not apply paint to pipe sections.

(4) Inspect pipe sections for holes, dents, and excessive rusting condition. Replace pipe as required.

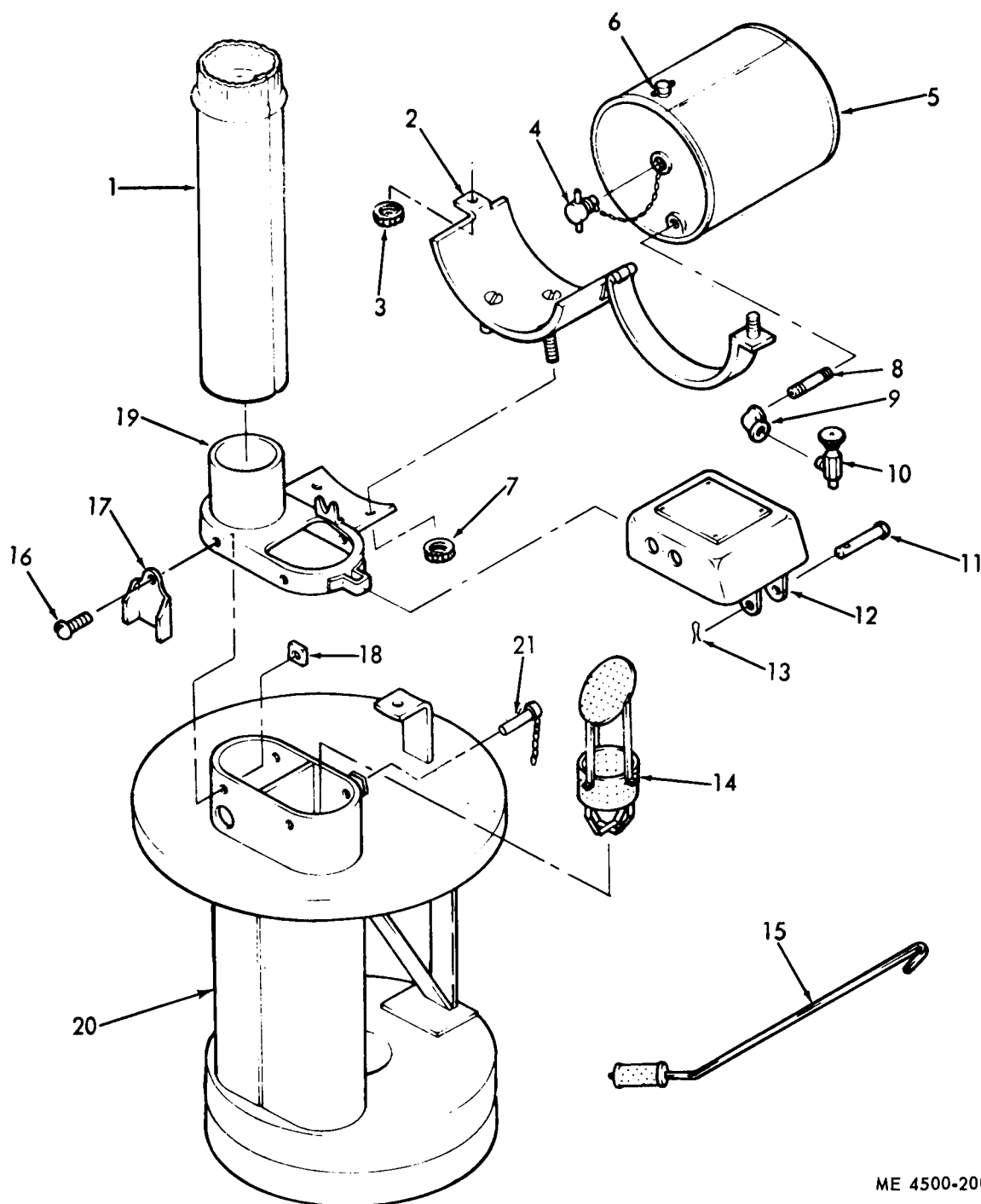
*c. Installation.* Install pipe sections as described in paragraph 5-6.

#### 5-23. Vent Plug Gasket

*a. Removal.* Refer to figure 5-6 and remove vent plug gasket (3).

*Note.* Do not try to remove vent plug from tank. Back off vent plug 3 turns approximately.

*b. Inspection.* Inspect gasket for evidence of deterioration and/or missing condition. Replace as required.



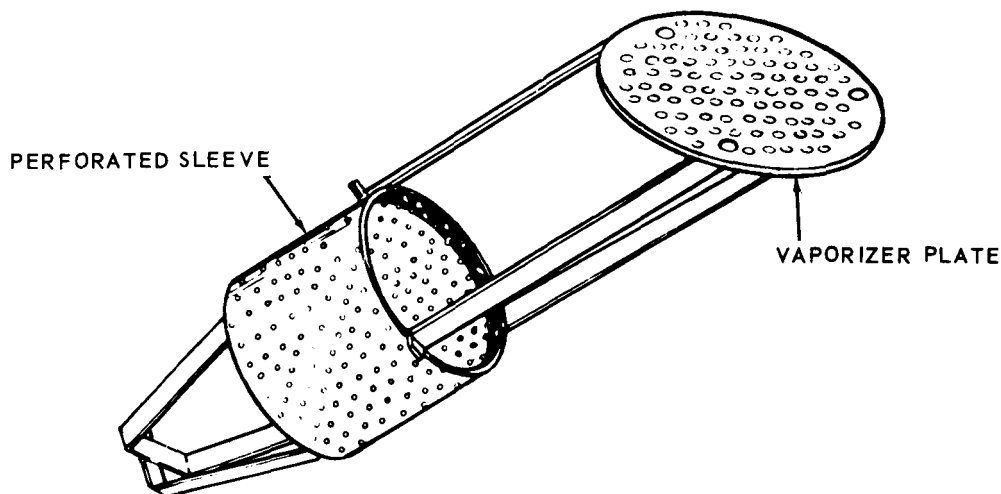
ME 4500-200-13/5-6 C3

- 1 Air conditioning-heating pipe
- 2 Strap, fuel tank
- 3 Nut
- 4 Plug w/chain
- 5 Tank, fuel
- 6 Gasket, vent plug
- 7 Nut
- 8 Nipple
- 9 Elbow
- 10 Drip valve
- 11 Pin, hinge

- 12 Hood, burner
- 13 Pin, cotter
- 14 Burner
- 15 Lighter, burner, torch
- 16 Screw, draft gate
- 17 Gate, draft
- 18 Nut
- 19 Collar
- 20 Heater body
- 21 Pin

Figure 5-6. Immersion heater-exploded view.





ME 4500-200-13/5-7

Figure 5-7. Burner.

## Section X. TROUBLESHOOTING

### 5-24. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the immersion heater. Malfunctions which may

occur are listed in table 5-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 5-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Heater fails to start.	a. Insufficient preheating of flue.	Repeat preheating. Leave lighter in flue compartment until heater starts (para 5-11).
	b. Vent plug closed.	Open vent plug (para 5-11).
	c. Fuel tank empty.	Remove and fill tank (para 5-1).
	d. Water present in combustion chamber.	Clear water from combustion chamber (para 5-15).
2. Burner goes out	a. Fuel tank empty.	Remove and fill tank (para 5-1).
	b. Vent plug closed or clogged.	Open vent plug and be sure it is free from obstruction (para 5-11).
	c. Water present in combustion chamber.	Clear water from combustion chamber para 5-15).
	d. Fuel rate too slow.	Open fuel valve (para 5-11).
	e. Flame blown out.	Shield heater from wind (para 5-1 3).
3. Heater smokes	a. Fuel rate too fast.	Close fuel valve slightly (para 5-11).
	b. Stack is too short.	Be sure to use at least four sections of pipe (para 5-6).

## Section XI. ORGANIZATIONAL MAINTENANCE PROCEDURES

### 5-25. Draft Gate

*a. Removal.* Refer to figure 5-6, and remove the draft gate supporting screw (16), the draft gate screw nut (18), and the draft gate (17) from the heater body.

*b. Inspection.* Inspect the draft gate for a warped and distorted condition. Replace the draft gate as required.

*c. Installation.* Refer to figure 5-6, install the draft

gate (17) on the heater body, and secure it with the draft gate supporting screw (16) and the draft gate screw nut (18).

### 5-26. Hood

*a. Removal.*

(1) Refer to figure 5-6 and remove the cotter pin (13) from the hinge pin (11).

(2) Remove the hinge pin (11), and lift off the hood (12) from the burner collar (19).

*b. Inspection.* Inspect hood for distorted condition and/or a broken hinge. Replace hood as required.

*c. Installation.*

(1) Refer to figure 5-6 and place the hood (12) on the burner collar (19).

(2) Insert hinge pin (11) and secure it with cotter pin (13).

### 5-27. Fuel Tank Filler Plug

*a. Removal.* Refer to figure 5-6 and remove filler plug (4) from the fuel tank (5).

*b. Inspection.* Inspect plug for damaged gasket or threads. Replace plug as required.

*c. Installation.* Refer to figure 5-6 and install filler plug (4) on the fuel tank (5).

### 5-28. Fuel Tank

*a. Removal.*

(1) Refer to figure 5-6 and remove three wingnuts (7) holding strap (2) to heater.

(2) Remove wingnut (3) securing fuel tank.

(3) Lift out fuel tank (5) from holding strap.

*b. Cleaning and Inspection.*

(1) Drain tank.

(2) Clean outside of tank with a stiff brush and hot water.

(3) With fuel valve removed, flush fuel tank with a small amount of fuel to be sure all sediment and foreign matter are removed.

(4) Inspect tank for leaks. Replace tank as required.

*c. Installation.*

(1) Refer to figure 5-6 and install holding strap on heater with three wingnuts (7).

(2) Install fuel tank (5) onto holding strap (2).

(3) Secure fuel tank holding strap clamp with wingnut (3).

### 5-29. Cover-Hole Cover

*a. General.* A cover hole was originally provided on the standard models of the tank heaters for the purpose of adding water to the tank. On the modified standard models, the hole has been covered with a thin plate of steel (fig. 5-2).

*b. Removal.*

(1) Refer to figure 5-2 and remove wingnuts from the squarehead bolts welded to the under side of the cover.

(2) Lift off cover.

*c. Installation.* Refer to figure 5-2 and install the hole cover on the heater tank cover. Secure the cover with two wingnuts.

### 5-30. Fuel Tank Strap Cradle

*a. Removal.*

(1) Remove fuel tank from strap cradle (para 5-28).

(2) Refer to figure 5-6 and remove three wingnuts that secure the cradle (2) to the heater.

*b. Inspection.* Inspect cradle for distorted condition and for missing fasteners. Replace cradle as required.

*c. Installation.*

(1) Refer to figure 5-6 and secure the fuel tank strap cradle (2) to the heater with three wingnuts.

(2) Install fuel tank and secure strap (para 5-28).

(3) Refer to figure 5-6 and install cradle (2) on heater and secure with three wingnuts.

### 5-31. Fuel Valve Assembly

*a. Removal.* Refer to figure 5-6 and unscrew fuel valve with elbow and nipple from fuel tank (5).

*b. Cleaning.* Scrape or scrub off any corrosion from valve. Clean out any obstruction from inside valve.

*c. Inspection.* Inspect fuel valve for evidence of excessive wear and leaking condition.

*d. Installation.* Refer to figure 5-6 and screw nipple into fuel tank with elbow and fuel valve attached.

## Section XII. SHIPMENT AND LIMITED STORAGE

### 5-32. Preparation of Equipment for Shipment Within Zone of Interior

*a. General.* Detailed instructions for the preparation for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

*b. Inspection.* Examine the heater for any unusual conditions such as damage or missing components. Inspect the immersion heater in accordance with steps outlined in Quarterly Preventive Maintenance Services (para 5-18). Deficiencies and shortcomings, along with corrective action taken, will be recorded on D-A Form 2404 (Refer to TM 38-750).

*c. Cleaning and Drying.* Cleaning and drying by an approved technique is the first essential procedure in any effective preservation process. Approved methods of cleaning and drying, types of preservatives and methods of application are described in TM 38-230.

*d. Painting.* Paint surfaces where the paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

*e. Depreservation Guide.* Record depreservation instructions on DA Form 2258 or DD Form 1397 as applicable.

*f. Sealing of Openings.* Openings that will permit the direct entry of water into the interior of fuel

lines, oil burner, fittings, burner chamber, and fuel tank, shall be sealed with pressure-sensitive tape conforming to specification PPP-T-60, class 1, or covered with waterproof kraft wrapping paper (UU-P-271) secured in place with tape.

*g. Fuel Tank (Boxed or Crated Items).* Drain the fuel tank after heater preservation.

*h. Exterior Surfaces.*

(1) Apply a thin coat of CFM (Corrosion Preventive Compound, Federal Stock Number 8030-251-5048) to all surfaces of the burner, fuel valve, heater body, and fuel tank.

(2) Coat the threads of screws, bolts, and nuts with a thin film of PL-Medium (Lubricating Oil, General Purpose Preservative). This lubricant is to be used for shipment and storage purposes only and must be removed before putting the heater into operation.

*i. Disassembly, Disassembled, and Basic Issue Items.* Disassembly shall be limited to the removal of components and parts that are subject to pilferage or damage. Removed parts and basic issue items shall be packaged in a suitable container(s) and

secured to heater to prevent loss or damage. Refer to TM 38-230 for guidance in container construction.

*j. Markings.* Mark in accordance with MIL-STD-129.

### 5-33. Limited Storage

*a. General.* This paragraph provides instructions for preparation of the immersion heater for limited storage, not to exceed six months.

*b. Inspection and Maintenance of Equipment in Storage.* When heaters have been placed in limited storage, all scheduled preventive maintenance services, including inspection, shall be suspended and preventive maintenance inspection shall be performed as specified herein. Perform quarterly preventive maintenance services when the heater is initially placed in limited storage and every 90 days thereafter. Record all deficiencies and shortcomings, together with corrective action taken, on DA Form 2404. Required maintenance will be performed promptly to insure that the heater is mechanically sound and ready for immediate use. After each inspection, represerve the heater.

## Section XIII. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

### 5-34. General

When capture or abandonment of the heater to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all heaters and all corresponding repair parts.

### 5-35. Demolition to Render the Heater Inoperative

*a. Demolition by Mechanical Means.* Use sledge hammers, crowbars, picks, axes, or any other heavy tool which may be available to destroy the following

- (1) Air-conditioning-heating pipes
- (2) Fuel tank
- (3) Heater body
- (4) Fuel valve

*b. Other Demolition Methods.*

(1) Scattering and concealment. Remove all easily accessible components and scatter them through dense foliage, bury them in dirt, or submerge them in a lake, stream, or other body of water.

(2) Submersion. Totally submerge the heater in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

*c. Training.* All operators should receive thorough training in the destruction of the heater. Refer to Form 5-25. Simulated destruction, using methods given above, should be included in the operator training program. It must be emphasized in training that demolition operations usually are necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction without reference to this or any other manual.

## Section XIV. DIRECT SUPPORT MAINTENANCE INSTRUCTION

### 5-36. Heater Body

Heater body repair is limited to welding open seams

on the combustion chamber and broken welds and holes in the stack partition.

## Section XV. REPAIR PARTS

### 5-37. General

The following tabular listings comprise the repair parts applicable to the immersion heater. For ex-

planation of listings, refer to chapter 1, section II of this manual.

(1) SMR code	(2) Federal stock number	(3) Description  Usable- on code	(4) Unit of meas	(5) Qty inc in unit	(6) 15-Day Organizational Maintenance allow				(7) Illus- tration	
					(a) 1-5	(b) 6-20	(c) 21-50	(d) 1-100	(a) Fig No	(b) Item No.
00001		PART I-REPAIR PARTS FOR ORGANIZATIONAL MAINTENANCE GROUP 01-IMMERSION HEATER FOR TANK TRAILER								
X 00002 P O	4540-542-2930	BODY, HEATER	ea	1					5-6	20
00003 P O	4540-555-8530	BURNER: (31577) 57015-91.	ea	1	*	2	3	7	5-6	14
00004		GATE, DRAFT: With supporting stud and nut swing type (31577) 57125-91.	ea	1	*	*	*	*	5-6	17
O 00005 P O	4730-249-1474	ELBOW, PIPE: 1/8x90 deg	ea	1					5-6	9
00006 P O	4540-125-3769	GASKET, VENT PLUG: (48745) K12793.	ea	1	*	*	2	2	5-6	6
00007 P O	4540-555-0771	HOOD, BURNER: (31577) 57013-91.	ea	1	*	*	*	*	5-6	12
00008 O	4540-555-0942	LIGHTER, TORCH: (81349) MILH1597.	ea	1	2	3	6	13	5-6	15
00009 O	4730-196-1482	NIPPLE, PIPE: 1/8 in. x 2 3/8 in.	ea	1					5-6	8
00010 O	5310-010-5604	NUT, PLAIN, SQUARE: 1/4 in., 20	ea	4					5-6	18
00011 O	5310-124-9266	NUT, CYLINDRICAL: (81377) 5-13-449.	ea	3					5-6	7
00012 O	5310-00-828-818	NUT, PLAIN, WING (81377) MS35425-72.	ea	1					5-6	3
00013 O	5315-011-9117	PIN, COTTER: 3/32 in. x 1/2 in.	ea	1					5-6	13
00014 X20	5315-013-7258	PIN, COTTER: 3/16 in. x 13/4 in. (08288) MSS5315-6.	ea	1					5-6	
00014A P O		PIN, LUG: W/chain (81377) 5-13-447.	ea	1					5-6	21
00015 P O	4520-277-8339	PIPE, AIR CONDITIONING: (31577) 57026-1.	ea	4	2	4	8	18	5-6	1
00016 O	4540-555-8527	PLUG, FILLER: (31577) 56950-91.	ea	1	*	*	*	2	5-6	4
00017 P O	5305-988-1723	SCREW, MACHINE: 1/4 in., 20x1/2 in.	ea	4					5-6	16
00018 P O	4540-00-368-7438	STRAP, FUEL TANK: (81377) 5-13-449.	ea	1	*	*	*	*	5-6	2
00019 P O	4540-555-8529	TANK: (31577) 56974-1.	ea	1	*	*	*	*	5-6	5
00020	4540-555-8531	VALVE: (81377) 5-13-5.	ea	1	*	*	*	*	5-6	10

(1) SMR code	(2) Federal stock number	(3) Description  Ref number & mfr code	(4) Unit of meas	(5) Qty inc in unit	(6) 30-Day DS Maintenance alw			(7) 1-Yr lw pe 100 equip cntgy	(8) Illus- tra	
					(a) 1-5	(b) 6-20	(c) 21-50		(a) Fig. No.	(b) Item No.
00001		PART II-REPAIR PARTS FOR DS MAINTENANCE GROUP 01-IMMERSION HEATER FOR TANI TRAILERS								
X 00002		BODY, HEATER	ea	1					5-6	20
P O 00003	4540-542-2930	BURNER: (31577) 57015-91.	ea	1	3	7	13	160	5-6	14
P O 00004	4540-555-8530	GATE, DRAFT: With supporting stud and nut swing type (31577) 57125-91.	ea	1	*	*	2	8	5-6	17
O 00005	4730-249-1474	ELBOW, PIPE: 1/8x90 deg	ea	1					5-6	9
P O 00006	4540-125-3769	GASKET, VENT PLUG: (48745) K12793.	ea	1	2	2	2	40	5-6	6
P O 00007	4540-555-0771	HOOD, BURNER: (31577) 57013-91.	ea	1	*	*	*	5	5-6	12
P O 00008	4540-555-0942	LIGHTER, TORCH: (81349) MILH1597.	ea	1	6	13	25	300	5-6	15
O 00009	4730-196-1482	NIPPLE, PIPE: 1/8 in. x 2 3/8 in.	ea	1					5-6	8
O 00010	5310-010-5604	NUT, PLAIN, SQUARE: 1/4 in., 20	ea	4					5-6	18
O 00011	5310-124-9266	NUT, CYLINDRICAL: (81377) 5-13-449.	ea	3					5-6	7
O 00012	310-00-828-8189	NUT, PLAIN, WING (96906) MS35425-72.	ea	1					5-6	3
O 00013	5315-011-9117	PIN, COTTER: 3/32 in. x 1/2 in.	ea	1					5-6	13
O 00014	5315-013-7258	PIN, COTTER: 3/16 in. x 1 3/4 in. (08288) MSS5315-6.	ea	1					5-6	
X20 00014A		PIN, LUG: W/ chain	ea	1					5-6	21
P O 00015	4520-277-8339	PIPE, AIR CONDITIONING: (31577) 57026-1.	ea	4	8	17	33	400	5-6	1
P O 00016	4540-555-8527	PLUG, FILLER: (31577) 56950-91.	ea	1	*	2	2	20	5-6	4
O 00017	5305-988-1723	SCREW, MACHINE: 1/4 in., 20x1/2 in.	ea	4					5-6	16
P O 00018	1540-00-368-4738	STRAP, FUEL TANK: (81337) 5-13-449.	ea	1	*	*	*	5	5-6	2
P O 00019	4540-555-8529	TANK: (31577) 56974-1.	ea	1	*	*	2	10	5-6	5
P O 00026	4540-555-8531	VALVE: (81377) 5-13-5.	ea	1	*	*	2	11	5-6	10

**INDEX - Federal Stock Number and Reference Number  
Cross-Reference to Index Number**

<i>Stock number</i>	<i>Index No</i>	<i>Stock Number</i>	<i>Index No.</i>	<i>Stock Number</i>	<i>Index No.</i>
4520-277-8339	00015	4740-555-8527	00016	5305-488-1723	00017
4540-125-3769	00006	4540-555-8529	00019	5310-010-5604	00010
4540-368-7438	00018	4540-555-8530	00004	5310-011-9117	00013
4540-542-2930	00003	4540-555-8531	00020	5310-124-9266	00011
4540-555-0771	00007	4730-196-1482	00009	5310-124-9266	00011
4540-555-0942	00008	4730-249-1474	00005	5310-00-828-8189	00012
				5315-013-7258	00014

<i>Reference No</i>	<i>Mfr. Code</i>	<i>Index No.</i>	<i>Reference No.</i>	<i>Mfr Code</i>	<i>Index No.</i>
K12793	48745	00006	56950-91	31577	00016
MILM1597	81349	00008	56974-1	31577	00019
MSS5315-6	08288	00014	57013-91	31577	00007
MS35425-72	96906	00012	57015-91	31577	00003
5-13-447	81337	00014A	57026-1	31577	00015
5-13-449	81337	00018	57125-91	31577	00004
5-13-5	81337	00020			

## APPENDIX A

### REFERENCES

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#### A-1. Maintenance

TB 10-4500-200-13

Assembly and Fabrication Procedures for Accessories Required to Adapt a 55-Gallon Drum to a Fuel Supply Tank Used with Heater, Space, Radiant Type, Portable (Type II, Model 1941 Liquid Fuel) FSN 4520-927-4214.

DA PAM 738-750

The Army Maintenance Management Systems (TAMMS)

#### A-2. Painting

TM 43-0139

Painting Instructions for Army Materiel

#### A-3. Shipment and Storage

TB 740-97-2

Preservation of USAMECOM Mechanical Equipment for Shipment and Storage

TM 38-230-2

Preservation, Packaging, and Packing of Military Supplies and Equipment Packing (Volume II).

#### A-4. Demolition

TM 750-244-3

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Commands).

**APPENDIX B**  
**BASIC ISSUE ITEMS LIST**

Deleted by Change 3



## APPENDIX C

### MAINTENANCE ALLOCATION CHART

#### Section I. INTRODUCTION

##### C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from section II

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

##### C-2. Explanation of Columns in Section II

a. *Group Number, Column (1).* The functional group is a numerical group set up on a functional basis normally in accordance with their function and proximity to each other.

b. *Functional Group, Column (2).* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions, Column (3).* This column lists the various maintenance functions (A through K) and indicates the lowest maintenance level authorized to perform these functions. The symbol designations for the various maintenance levels are as follows:

- C - Operator or crew
- O - organizational maintenance
- F - Direct support maintenance

The maintenance functions are defined as follows:

- A - Inspect: To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.
- B - Test To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
- C - Service: To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.
- D - Adjust: To rectify to the extent necessary to bring into proper operating range.
- E - Align: To adjust specified variable elements of an item to bring to optimum performance.
- F - Calibrate: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

- G - Install: To set up for use in an operational environment such as an emplacement, site, or vehicle.
- H - Replace: To replace unserviceable items with serviceable assemblies, subassemblies, or parts.
- I - Repair: To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.
- J - Overhaul: To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.
- K - Rebuild: To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. *Tools and Equipment, Column (4).* This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sec. II).

e. *Remarks, Column (5).* This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

##### C-3. Explanation of Columns in Section III

a. *Reference Code.* This column consists of a number and a letter separated by a dash. The number references the TandTE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. *Maintenance Category.* This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. *Nomenclature.* This column lists the name or identification of the tool or test equipment.

d. *Tool Number.* This column lists the manufacturer's code and part number, or Federal Stock Number of tools and test equipment.

##### C-4. Explanation of Columns in Section IV

a. *Reference Code.* This column consists of two letters separated by a dash, both of which are references to section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. *Remarks.* This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, section II.

## Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	I	I	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
60	HEATING UNITS, BURNERS													
	HEATERS, SMALL TENT													
	M1941 (TYPE I & II)													
	Body Assembly													
	Body . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . A
	Fuel System													
	Adapter kit (Type II)	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2,3.	. . . B
	Vent tube . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2.	. . . C
	Hose assembly	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2,3.	. . . D
	Burner Assembly													
	Burner, oil pot . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	3 . . .	. . . E
	Grate . . . . .	. . . . .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . F
	Valve, float (Type II)	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . G
	Exhaust System													
	Pipe, air conditioning heating . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . H
	Cap, flue . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . I
	Damper, flue . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . J
	Spark arrestor . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . K
	Lines, guy . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . L
	HEATER, SMALL TENT													
	M1950 (YUKON)													
	Body Assembly													
	Body . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. F .	. . . . .	. . . . .	. . . . .	. . . A
	Fuel System													
	Adapter kit . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2,3 B	. . . . .
	Vent tube . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2.	. . . C
	Hose assembly . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,2,3.	. . . D
	Burner Assembly													
	Burner . . . . .	. C .	. C .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	3 . . .	. . . E
	Valve, drip . . . . .	. C .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	1,3.	. . . F
	Exhaust System													
	Pipe, air conditioning heating . . . . .	. C .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . G
	Cap, flue . . . . .	. C .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . H
	Lines, guy . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . I
	HEATERS, IMMERSION													
	Body Assembly													
	Body . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. F .	. . . . .	. . . . .	. . . . .	. . . A
	Gate, draft . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . B
	Fuel System													
	Cradle, fuel tank strap . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . C
	Strap, fuel tank . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . D
	Plug, filler, fuel tank . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . E
	Gasket, vent plug . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
	Burner Assembly													
	Burner . . . . .	. C .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . F
	Valve assembly . . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . G
	Hood, burner . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . H
	Lighter cup . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . I
	Retainer, wick . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . J
	Wick . . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. O .	. . . . .	. . . . .	. . . . .	. . . . .	. . . K
	Exhaust System													
	Pipe air conditioning . . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. C .	. . . . .	. . . . .	. . . . .	. . . . .	. . . L

**Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS**

Reference Code	Maintenance Category	Nomenclature	Tool Number
1-C	C	Wrench, open end, fixed, double head type, 3/8 inch and 9/16 in. wrench openings 22", 5-1/8 inch long.	5120-293-0809
2-C	C	Wrench, open end, fixed, thin double head type, 1/4 inch and 7/16 inch wrench openings, 22" angle, 4-3/8 inch long.	5120-293-2123
3-C	C	Wrench, pipe V jaw style w/screwdriver on one end 7/8 inch maximum IPS opening 5 inches long.	5120-595-9193

**Section IV. REMARKS**

Reference Code	Remarks
	<b>HEATERS, SMALL TENT (M1941) (TYPE I &amp; II)</b>
A-A	Inspect door for alignment.
B-A*	Inspect for leaks and damage to adapter.
C-A*	Inspect vent tube for looseness and damage to tube and threads.
D-A*	Inspect hose for breaks and deterioration.
D-C*	Tighten hose connections.
E-A	Inspect hoses in burner pot for obstructions.
E-C	Keep small hoses in burner pot free from carbon, soot and rust by cleaning with matchstick or wooden peg.
F-C	Clean grates.
G-A*	Inspect float valve to see that it is securely mounted and properly connected and for damaged controls.
H-A	Inspect for holes and clogged pipes.
H-C	Clean soot and carbon from pipes.
I-A*	Inspect for holes and clogged cap.
I-C*	Clean soot and carbon from cap.
J-A	Inspect flue damper for operability.
J-C	Clean soot and carbon from flue damper.
K-A	Inspect for holes and clogged arrestor.
K-C	Clean soot from arrestor.
L A	Inspect for worn or frayed lines.
	<b>HEATER, SMALL TENT M1950 (YUKON)</b>
A-A	Inspect door for alignment.
B-A*	Inspect for leaks and damage to adapter.
C-A*	Inspect vent tube for looseness and damage to tube and threads.
D-A*	Inspect hose for breaks and deterioration.
E-C*	Clean carbon deposit from burner body.
F-A*	Inspect valve for leaks.
G-A	Inspect for holes and clogged condition.
G-C	Clean soot and carbon from pipes.
H-A	Inspect cap for holes and clogged condition.
H-C	Clean flue cap.
L A	Inspect for worn or frayed lines.
	<b>HEATERS, IMMERSION</b>
A-A*	Inspect for dents or open seams, holes or broken welds.
A-C*	Clean dust, grease, and scale from immersion heater body.
B-A*	Inspect draft gate for cracks and immersion.
F-A*	Inspect immersion burner for evidence of cracks and distortion.
F-C*	Clean immersion burner, evaporator plate.
G-C*	Clean any obstructions from fuel valve.
H-A*	Inspect burner hood for damage or distorted hinge.
I-A	Inspect lighter cup for evidence of distortion.
J-A*	Inspect wick for deterioration.
K-A*	Inspect wick retainer for loose fit.
L-C*	Clean soot from pipe sections.

\*APPLICABLE TO LIQUID FUEL ONLY

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By Order of the Secretary of the Army:

W. C. WESTMORELAND,  
*General, (United States Army)*  
*Chief of Staff.*

Official:

KENNETH G. WICKHAM,  
*Major General, United States Army.*  
*The Adjutant General*

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USAQMS (10)  
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Centers (2)  
Instl (2)  
Army Dep (2)  
MAAG (2)

*NC: State AG (3); Units same as active Army except one(1) copy to each unit.*

*USAR: Units same as active Army except one(1) copy to each unit.*  
For explanation of abbreviations used, see AR 310-50.

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## THE METRIC SYSTEM AND EQUIVALENTS

### LENGTH MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

### SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

### CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

### TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

### APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621

